AMERICAN MACHINIST

JULY 22, 1943

Conversion of Non-Essential Skills—Page 87

Take a Lesson from a Tin Fish

"Enemy destroyer dead ahead" . . . a torpedo plane swoops down level and low . . . a tin fish drops to the sea and streaks straight and true to blast another ship to destruction.

It takes over 5000 parts and 1200 different assemblies to make one of these complicated weapons and every one must be accurate to the closest tolerances, because the slightest error would mean no hit. Heald Bore-Matics have been chosen in many plants to help put much of this deadly precision into many torpedo parts.

If you have a boring or grinding problem that requires precision and fast production, take a lesson from the tin fish . . . by bringing your problem to Heald. Our engineers will gladly help you solve your problems of precision boring and grinding.

Precision boring, facing and chamfering operations are performed in each of the four hubs on Torpedo Bodies on the Heald No. 46B Bore-Matics shown above. The Bore-Matic is arranged with a single boring head carrying four tools and a horizontal rotary indexing fixture for indexing between operations in each hub. The part is located in the fixture on a vertical stake and from one dowel hole, and is clamped against the bottom face by a "C" washer and nut on top.

The Heald Machine Co., Worcester, Mass., U. S. A.

For More Precision Faster, bring your problems to Heald

AMERICAN MACHINIST

July 22, 1943

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AMERICAN MACHINIST —chips

Help-the-War Ideas . . . We hope you've had a chance to use the department "War-Winning Suggestions" which has been appearing in *American Machinist* since last November. The fact is that lots of people *have* been noticing it, but a few apparently misunderstood the purpose.

We occasionally get letters asking how the particular gadget or method mentioned is made . . . where it may be obtained . . . etc. Let us remind these correspondents that there *are* no such time- and labor-saving devices generally on the market. They are all individual ideas created in individual plants by individual workers, and are presented in the hope that interested parties can adopt them.

Here's how the process of getting "War-Winning Suggestions" works: Labor-management committees in various plants select the best production ideas generated in that plant. These are filtered through a number of judges, until the super-whoopers are chosen by the Board for Individual Awards, War Production Drive. These top ideas are then published.

American Machinist picks some of them up, as anyone might. But (as no one else does) we take the bare ideas—which are usually rather sketchy—and fatten them into understandable practices most any plant can use. We write letters to the originators, we get additional pictures and data, we spend many hours of editing time on each idea. Then we print it.

It's a lot of work, but we feel it's part of our job. And to carry the thing one step farther, we suggest that some Metal-Working plants may well watch these brain-children for manufacturing possibilities, now and post-war.

o

Stratosphere . . . *We've been waiting for it . . . now here it is. Someone in Washington finally got weary of tossing billions around, and has gone the boys one better. None other than Secretary Ickes, who tells us slightly dazed guys that U. S. assets are now over 12 trillion.*

Somehow the whole thing takes us back to our childhood when we challengingly said to the other kids "My Dad can make a million dollars." Then the next urchin would say "Mine can make a billion." And others followed "Mine can make a trillion . . . a quadrillion . . . a septillion . . . an octillion." About that time we would all try to think of the next "illion" and lose ourselves in wistful contemplation of the infinite. We feel somewhat the same today.

o

Palestine Post-War . . . Arabs or no Arabs, an aggressive firm in Haifa, Palestine, is right this minute thinking of how to garner business, come the peace. We just got a letter asking for names of reliable manufacturers who could be contacted for supplies of machine tools, raw materials and semi-finished articles. They sent a yard-long list of stuff they would need, ranging from milling machines to gages. Of course we sent them our "Where-to-Buy" Directory, which is (modestly speaking) the most complete source of Metal-Working products we know of.

This incident set us thinking thus: Firms in other countries will be deadly serious about post-war business. Who will sell to them? Who will compete with them? How? Something to put in your "Little Black Book."

o

More Women . . . *The ink had hardly gotten dry on our report (July 8 issue) from the OWI that 1,900,000 women and 800,000 older men would be needed to meet the necessities of the war program, than we were thrown for a loop. WMC McNutt now says, via the daily press, that no fewer than 10,000,000 older men and women will be needed for courses for war work and agriculture during the fiscal year 1943–44. Oh well . . . serves us right for sticking our necks out by repeating Washington statements.*

o

Suits and Slips . . . Never let it be said that—just because Metal-Working is about half of all industrial activity—we are too engrossed in our own business to feel a pang for the problems of others. We ran across these two headlines concerning the garment industry:

(1)—*Standards Approved for Slip Measurements*—There's many a slip 'twixt the ladies and the world, so we guess it's important to have approved standards, like they have for gears and things. But when you get to regimenting undercover stuff, it seems to us, that's being pretty drastic. Especially when the National Bureau of Standards and the National Women's Undergarment Manufacturer's Association, Inc. emphasized that the proposed standards covered "minimum measurements only." How about that big girl we met in . . . oh well, I guess they know their business.

(2)—*Coatless Troops Seen Causing Change in Suits*—Men in the armed forces going without suits, it is claimed, will present the greatest post-war problem for the men's clothing industry. We quote a clothier: "Men are casting aside more and more clothes. Some men wear pajamas without tops and some pajamas without bottoms. Some of us clothing people may feel we may soon have to resort to being Congressmen and Senators." (*That baffled us*).

"But we can handle the problem with new designs. Clark Gable had everyone going without undershirts until we redesigned undershirts. If Clark Gable appears as a soldier without a coat, we will have a problem."

Gable can wear pink tights, as far as we are concerned. We have been, for years, a pajama-without-tops and shorts-without-undershirt man. And will continue to be.

Seriously though, notice above the sentence "But we can handle the problem with new designs." Can you handle your post-war problem likewise?

o

On Keeping Customers Sweet . . . *We recently heard of a plan followed by one of the nation's leading companies which your firm may want to adopt. As so often happens these days, this particular company gets occasional gripes from customers who can't get their orders filled promptly. If these customers are important enough, they are invited to visit the manufacturer's plant—expenses paid—to inspect operations and get a better understanding of the problems involved and why deliveries can't always be made right off.*

Not something you could afford to do every day for everybody, but darned swell "peace medicine" for the boys who buy in big figures.

Controlled SURFACE HARDENING

with Gleason precision machine-tool equipment offers these distinct advantages:

direct hardening control . . . simultaneous hardening of both sides of tooth . . . desired penetration with burner speed control . . . same hardening time and depth for each tooth - - automatic speed control maintains uniform hardness on ends and throughout tooth length.

freedom from stress and distortion . . . small section of tooth heated at one time, with rapid heat diffusion through cold gear body, eliminating necessity of liquid quench.

metallurgically correct hardening . . . greatest hardness on tooth sides with gradual transition to unaffected core.

wide range of application . . . two machines cover broad range of straight and curved-tooth bevels, hypoids, spurs, helicals, internals above 24 D. P. up to 120" diameter.

fast, economical operation . . . only two simple inexpensive burners to change . . . short set-up time . . . no subsequent drawing necessary.

Write for our book "The Surface Hardening of Gear Teeth"

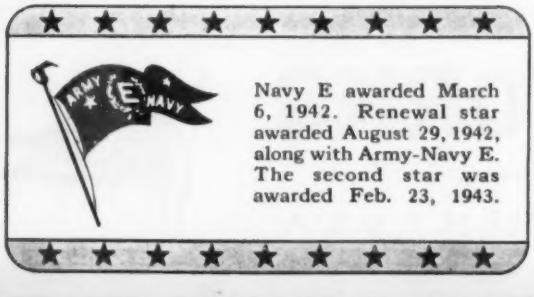
GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

ARMY E NAVY

From the front, visibility was zero. So the operator simply goes to the rear of the machine where another set of Independent Directional Controls enables him to handle the operation from a position where visibility is perfect. There's less walking and more accomplished: accuracy increased, fatigue reduced. The machine is a CINCINNATI High Speed Dial Type. Operation: Face-milling ends and sides of an upper station airplane truss.



Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

THE CINCINNATI

MILLING MACHINE

THEY ENJOY RUNNING AND THEY'LL STAY ON THE JOB

Two of the reasons frequently given by those who stay away from work are: "Operating that machine wears me down." Or: "Blind spots on that machine give me the jitters." Such excuses may or may not be justifiable, but why give employees a chance to blame the machine? Put them on machines that are easy to operate — machines that have no blind spots and you eliminate some of the favorite excuses for absenteeism. ¶ Such a machine is the CINCINNATI Dial Type Miller. It's admittedly easy to operate, and because of dual controls, front and rear, visibility on any milling operation is perfect. A good example is shown in the picture at the left. Employees operate Dial Types with confidence because they know exactly how the job will turn out and they're proud of the finished product. Every refinement (and there are plenty of them) and every element of manipulation has been designed to reduce operator fatigue. ¶ To fully appreciate these fine milling machines and their adaptation to a wide variety of operations, send for specification catalog M-970-1 which gives complete details on all features and benefits. For a brief description of all CINCINNATI Milling Machines look in Sweet's Catalog File for Mechanical Industries. ¶ Talk over your milling problems with the engineers here at Milling Headquarters. This group of Milling experts may be able to offer a solution. Feel free to use their services.

Illustrated at the right is a CINCINNATI No. 3 Plain High Speed Dial Type Milling Machine. Catalog M-970-1 gives complete specifications.

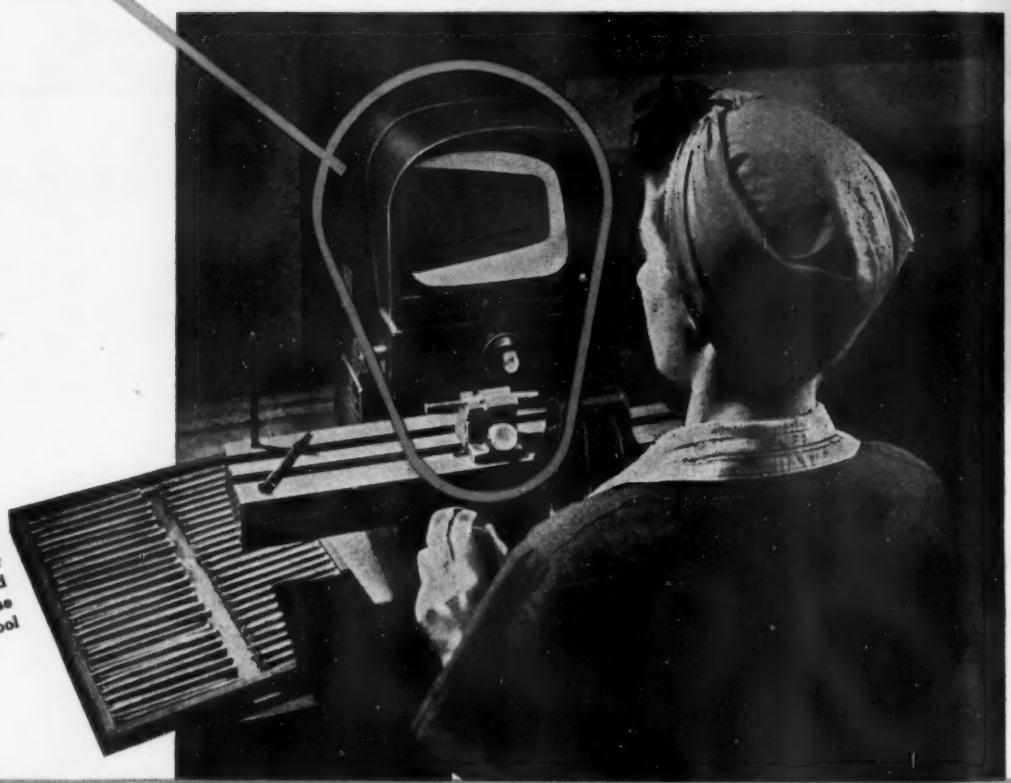
MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES

Indispensable

Jones & Lamson Optical Comparators are indispensable for the accurate, rapid inspection of irregular contours that are held to close limits. By no other means can they be inspected as positively and as rapidly.

Because of wartime restrictions we cannot illustrate many of the remarkable applications of these **Comparators,** how their use has solved seemingly impossible inspection problems and helped to speed the production of vital products. But — our inspection engineers are available to study your inspection problems and give you the benefit of more than twenty years' experience, pioneering and developing Inspection by Optical Projection.



Jones & Lamson Optical Comparators are used to inspect positively and rapidly punches and other products with symmetrical and irregular contours held to close limits, at the Westmount Tool Works, Canada.

COURTESY WESTMOUNT TOOL WORKS, QUEBEC, CANADA

JONES & LAMSON
MACHINE COMPANY

Springfield, **Vermont, U. S. A.**

Manufacturers of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies.

WAR PRODUCTION BULLETIN

Anti-Aircraft Gun-Part Production

expedited by utilizing Fellows Gear Shaper precision in cutting pawls, rachets and automatic firing mechanism parts.

Photo U.S. Army Signal Corps

Another

THE CUTTIN

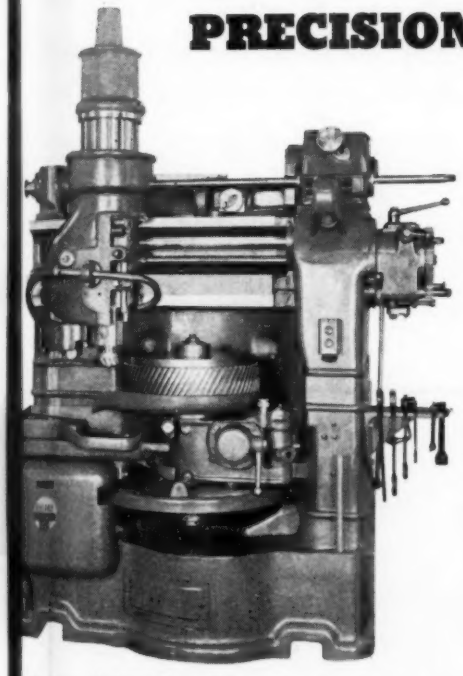
FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTI

GEAR SHAPER JOB . . .

OF BOFORS GUN PARTS ON A

PRECISION-PRODUCTION BASIS



7A-Type Fellows Gear Shaper

War-production needs for high-precision parts of irregular contour has brought home to a great number of machine shops, the point we have made, time and again, regarding the Gear Shaper's VERSATILITY. Cutters can be made for an infinite variety of shapes, placing at the disposal of the miscellaneous parts manufacturer, the same high-standard precision for which the Fellows Gear Shaper is so well known. With accuracy inherent in indefinitely-duplicated cutters, naturally close-tolerance duplication of work follows. For descriptive bulletins, write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, Mich., or 640 West Town Office Building, Chicago, Ill.

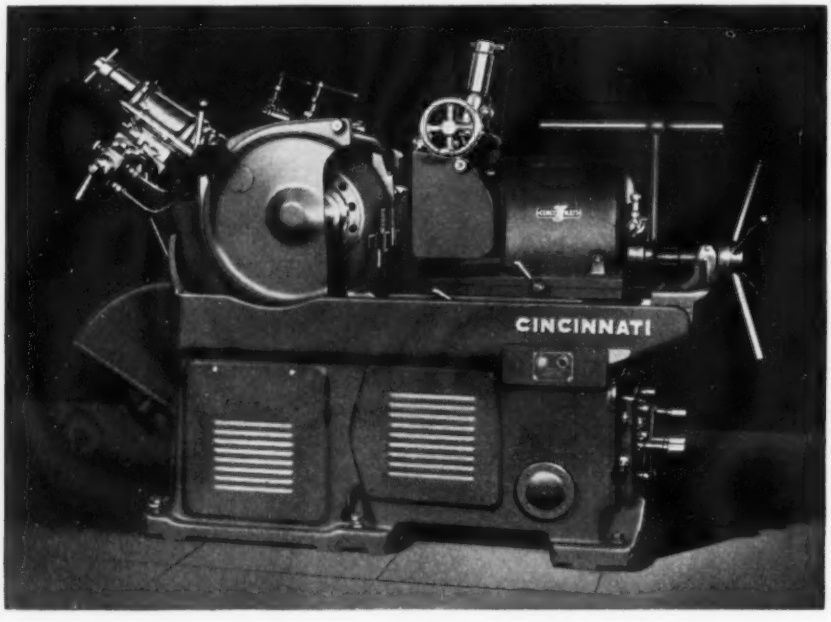
Method

. . . . FROM BLANK TO FINISHED GEAR

Give them machines

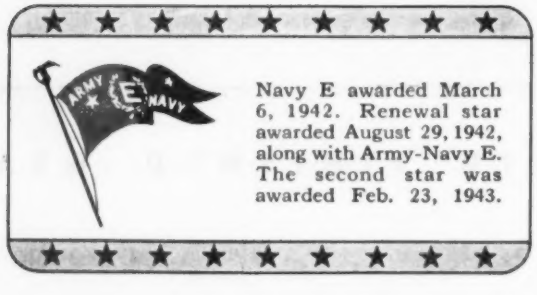
THEY ENJOY RUNNING AND THEY'LL •

"Operating that machine wears me down." And justifiable or not, many employees use this as an excuse for staying away from work. The engineers here at Grinding Headquarters are doing something to remedy this situation. One example is illustrated in the picture at the right. Here an automatic feeding device has been hooked up to a CINCINNATI No. 2 Centerless Grinding Machine. The operator simply keeps the hopper full and occasionally checks the accuracy. There's no work to it. All the tediousness has been taken out of this grinding job. ¶ There are any number of instances where Cincinnati engineers have recommended Centerless Grinders for operations which ordinarily would be handled on some other type of machine. Operating fatigue has been greatly reduced and production stepped up as much as seven to one. ¶ Install CINCINNATI Centerless Grinding Machines, and you not only remove one of the causes for absenteeism, but you get a grinder capable of fast, accurate, economical production of a wide variety of parts. Our engineers will be glad to discuss your grinding problems with you. They may be able to offer a solution for your difficulties. Feel free to use their services.



Illustrated at the left is a CINCINNATI No. 2 Centerless Grinding Machine. For complete specifications write for catalog G-456-1. Or look in Sweet's Catalog File for Mechanical Industries for a brief description.

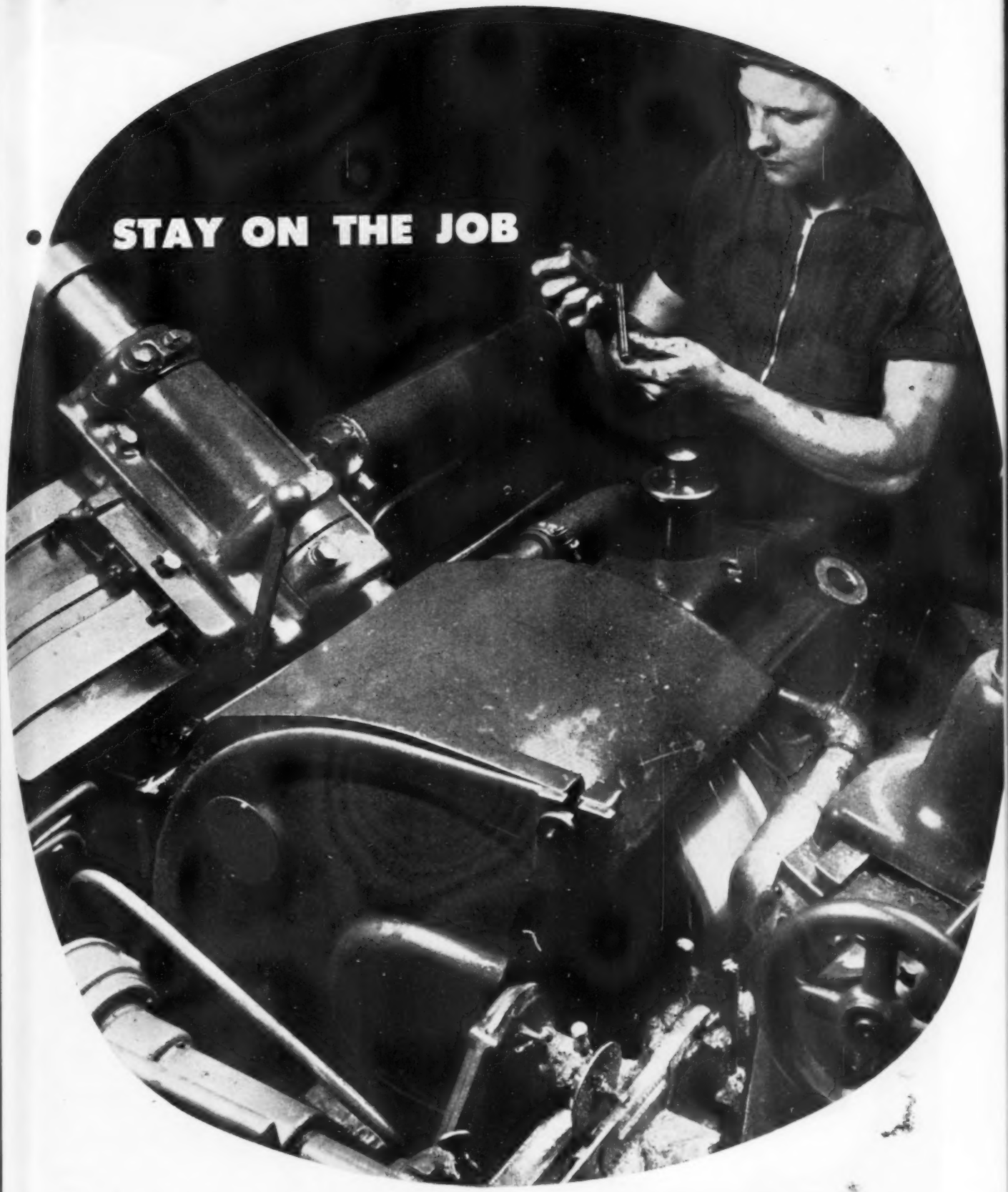
CINCINNATI



Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

CINCINNATI

CENTER TYPE GRINDING MACHINES



GRINDERS INCORPORATED

NCINNATI, OHIO, U. S. A.

NTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

SPECIFICATIONS

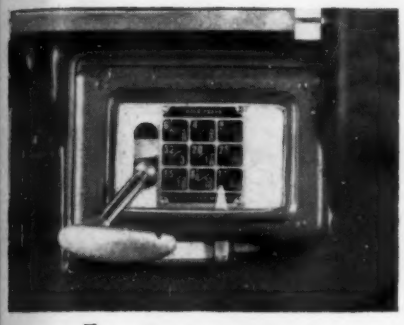
No. 36 UNIVERSAL MILLER. Table 58" x 13"
speeds: 30 to 1500 rpm. 18 feeds: ⅜" to
Range: 35" longitudinal, 12" cross, 22¼" vert

...IT PAYS TO

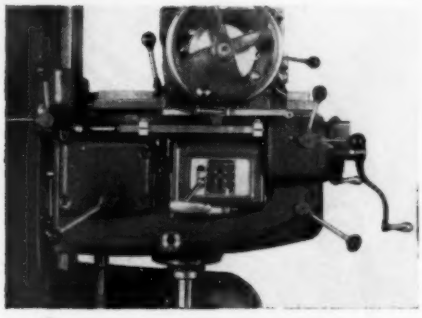
VAN NORMAN ADVANTAGES

that speed up production on

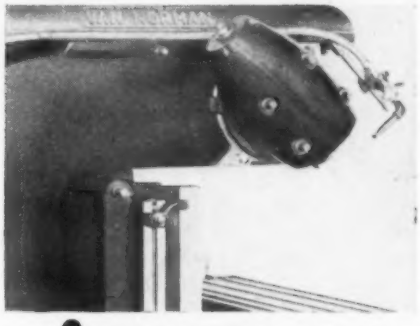
RAM TYPE UNIVERSAL MILLING MACHINES



1 ***ADJUSTABLE CUTTERHEAD***



2 ***FRONT AND REAR DIRECTIONAL CONTROLS***



3 ***SINGLE LEVER FEED SELECTOR***

Van Norman Ram Type Universal Millers provide operators with three distinct operating advantages that increase work accuracy, minimize work reset-ups, lessen worker's fatigue and speed production.

1. The *adjustable cutterhead* gives you precision horizontal, angular or vertical milling by simply swinging the cutterhead to the desired milling position. This feature enables operators to perform most milling operations without changing the original work set-up. It saves valuable man and machine hours because there is no waiting for other types of millers to become available and changing the work from one miller to another is eliminated.

2. *Front and rear directional controls* of all power feeds, including the 6-way rapid traverse, enable the operator to operate the machine from either the front or rear of the machine thereby providing greater work visibility. These controls operate in the direction of the table, saddle or knee movement thus the operator always knows that the unit will move in the direction that the lever is positioned.

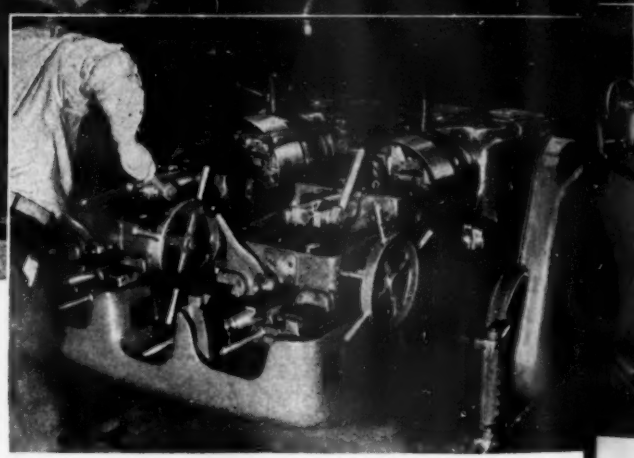
3. The *exclusive single lever feed selector* provides quick convenient selection of 18 feeds from $\frac{3}{8}$" to 32" rpm. on No. 36 illustrated. The operator merely moves the selector lever up or down and right or left to the desired speed indicated by the coincidental pointer on the direct reading dial. A quick change speed selector, located on front of ram provides 18 speeds from 30 to 1500 rpm.

VAN NORMAN MACHINE TOOL COMPANY

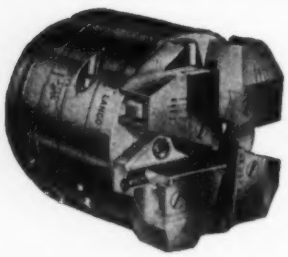
Springfield, Massachusetts

VAN NORMANIZE

They Keep the



Landis Precision Threads on the tough transmission studs of automotive war equipment mean longer wear and quick interchange of parts in field repair—a reason for the amazing performance of American automotive transportation.



LANDIS
WAYNESBORO

Front Lines Moving Forward and LANDIS THREADS *help Keep them Rolling*

Steering gears on supply trucks, troop carriers and jeeps get rough handling and hard wear. But Landis threaded steering knuckles assure perfect control, long life and top performance for our automotive war wagons no matter how tough the going.

MACHINE CO.
PENNA. U.S.A.

PHOTO COURTESY BELL AIRCRAFT CORP.

OUTSTANDING PERFORMERS

In aircraft plants from New Jersey to California, "American" Hole Wizard Radials are proving their reputation as outstanding performers on exacting jobs. On drilling, tapping, boring and facing they are hanging up records for quantity and quality production — records that are making it possible for American planes to overwhelm the Axis in every branch of aerial warfare.

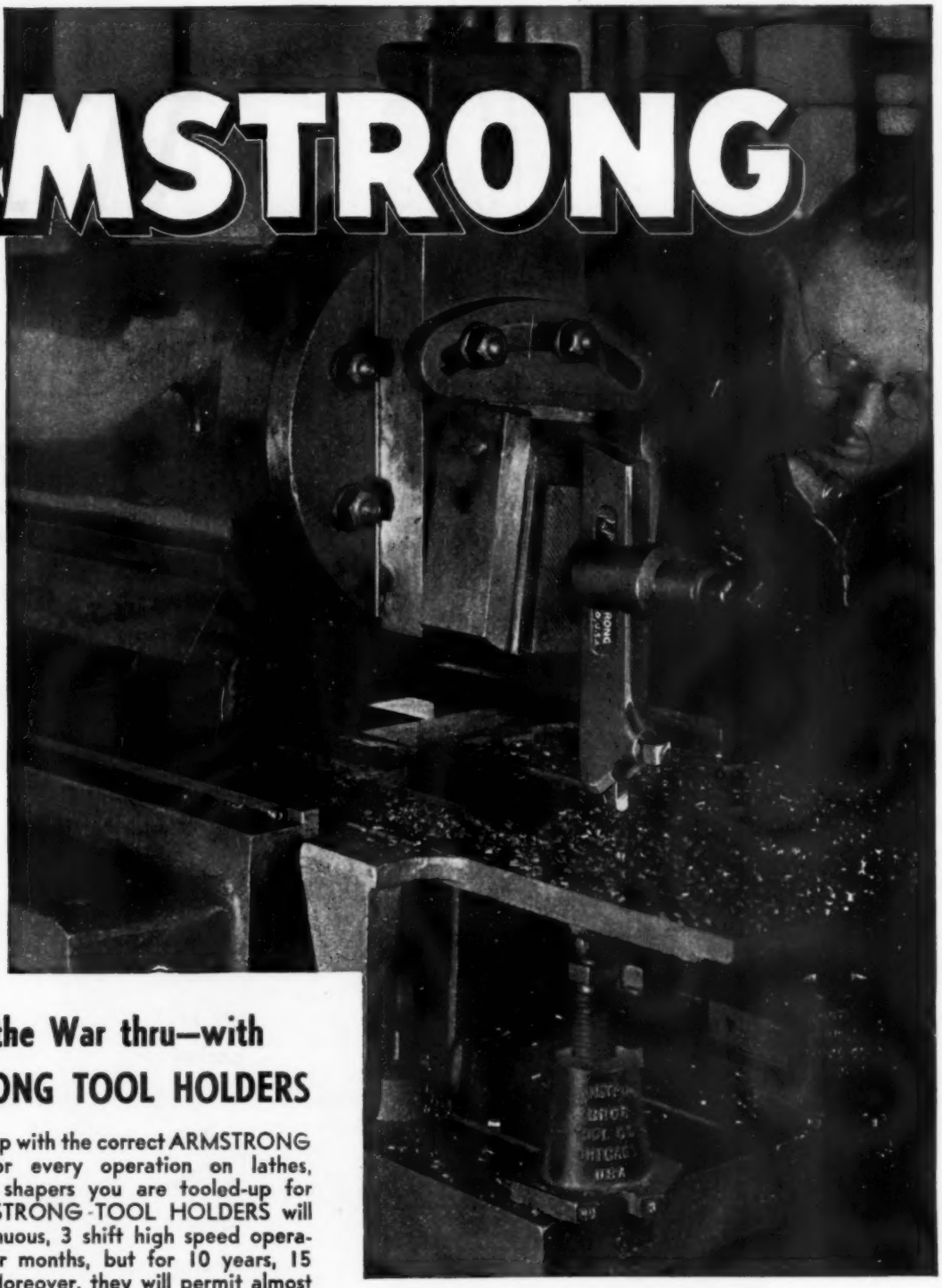
THE AMERICAN TOOL WORKS CO.

LATHES RADIALS SHAPERS

CINCINNATI OHIO

Army P-39 Airacobras like the one shown above are fighting for you on every front. They'll keep on fighting if we keep 'em flying! Buy War Bonds and Stamps every payday!

ARMSTRONG



Tooled to see the War thru—with ARMSTRONG TOOL HOLDERS

When you are tooled-up with the correct ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers you are tooled-up for the duration. ARMSTRONG TOOL HOLDERS will stand up under continuous, 3 shift high speed operations, not for days or months, but for 10 years, 15 years, indefinitely. Moreover, they will permit almost instant changes in product design without laborous re-tooling for each ARMSTRONG TOOL HOLDER is a multi-purpose tool that takes cutters ground to innumerable shapes and reduces tooling-up to the selection of the cutter, adjusting its clearance and tightening of a set screw.

With the correct ARMSTRONG TOOL HOLDER for each operation you can also increase speeds and feeds far beyond so called "standard" speeds, can materially speed up your war production and come out "tooled-up" for the next assignment.

ARMSTRONG BROS. TOOL CO.

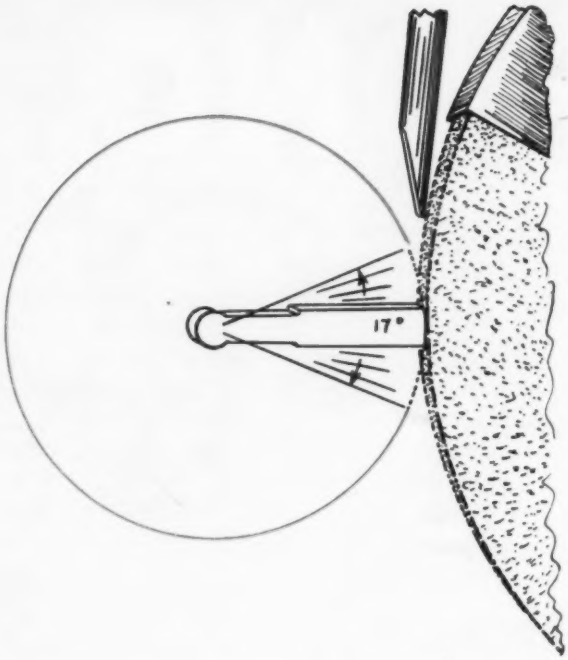
"The Tool Holder People"

315 N. Francisco Ave. Chicago, U. S. A.

Eastern Warehouse & Sales
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

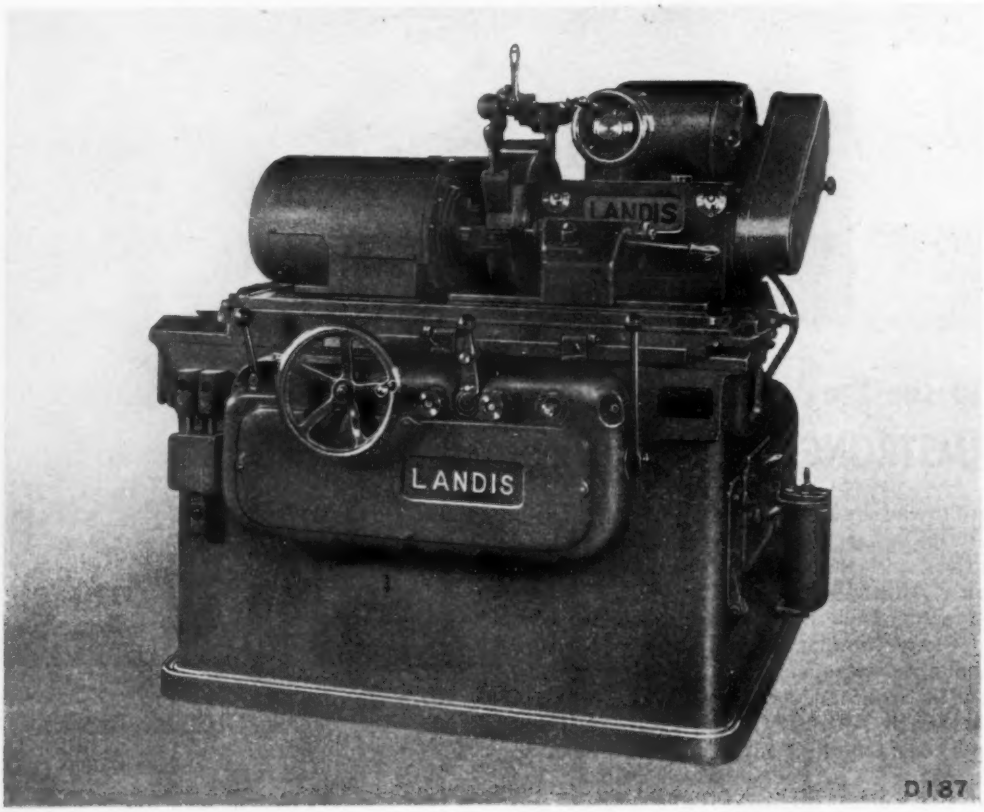
To Finish The Job Quicker . . .



WHY

Seems like an odd question, doesn't it? It has no particular point unless you are grinding a part with an intermittent cut. Then the grinding of air might prove time consuming and costly.

The drawing to the left illustrates the point quite well. It was necessary to grind the radius on a gun part known as a breech lock. About the only practical method that could be employed to hold the work was in a special fixture between centers as shown in the illustration below. Rotating the work in the usual manner would have caused the wheel to cut air the majority



PRECISION LANDIS GRINDERS

Unusual Performance As Usual

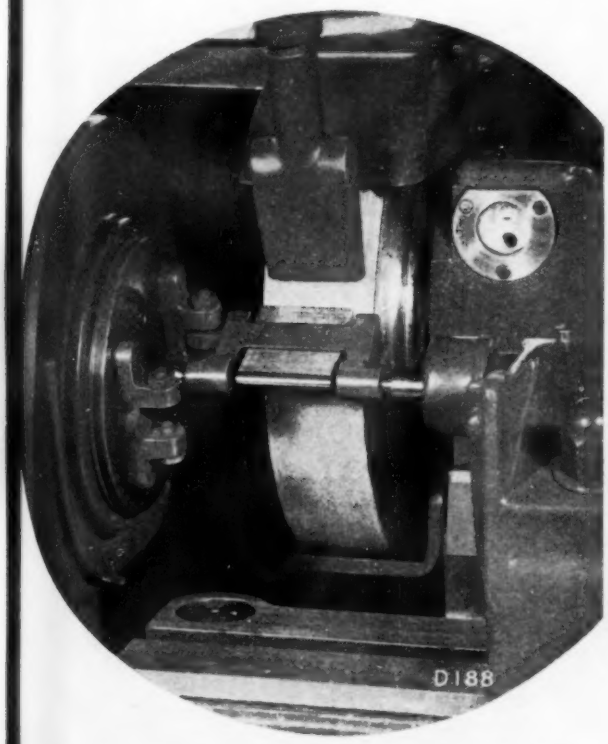
GRIND AIR?

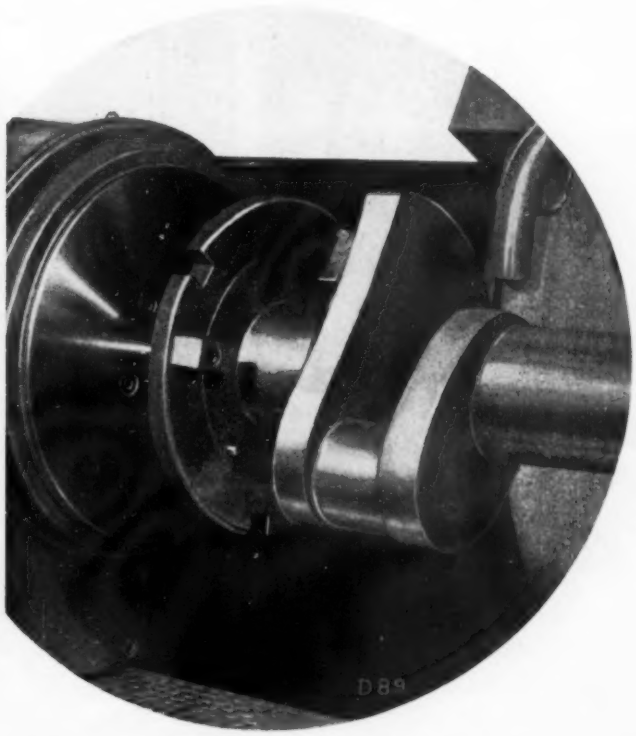
of the time because the arc to be ground was only 17°.

Solution of the problem by Landis engineers was the equipping of a 10" Type C Plain Grinder with a headstock having a hydraulically oscillated work spindle. The work, as a consequence, could be rapidly oscillated back and forth in front of the wheel. During most of the grinding period the wheel was actually working whereas, had the work been rotated in the usual manner, much loss of time would have resulted.

This method of handling has lent itself particularly well to a number of airplane crankshaft operations. One, grinding a liquid cooled shaft for balance, is shown below. Note that the radius ground in this instance is considerably greater than on the gun part but the same work spindle oscillating mechanism is used as it is adjustable for operation within a wide range.

Your grinders are not carrying their part of the load when they are grinding air. Give us the details surrounding any jobs of this kind in your plant. Maybe our experience will point the way to greatly increased production.





LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA

LANDIS EXCELLENCE

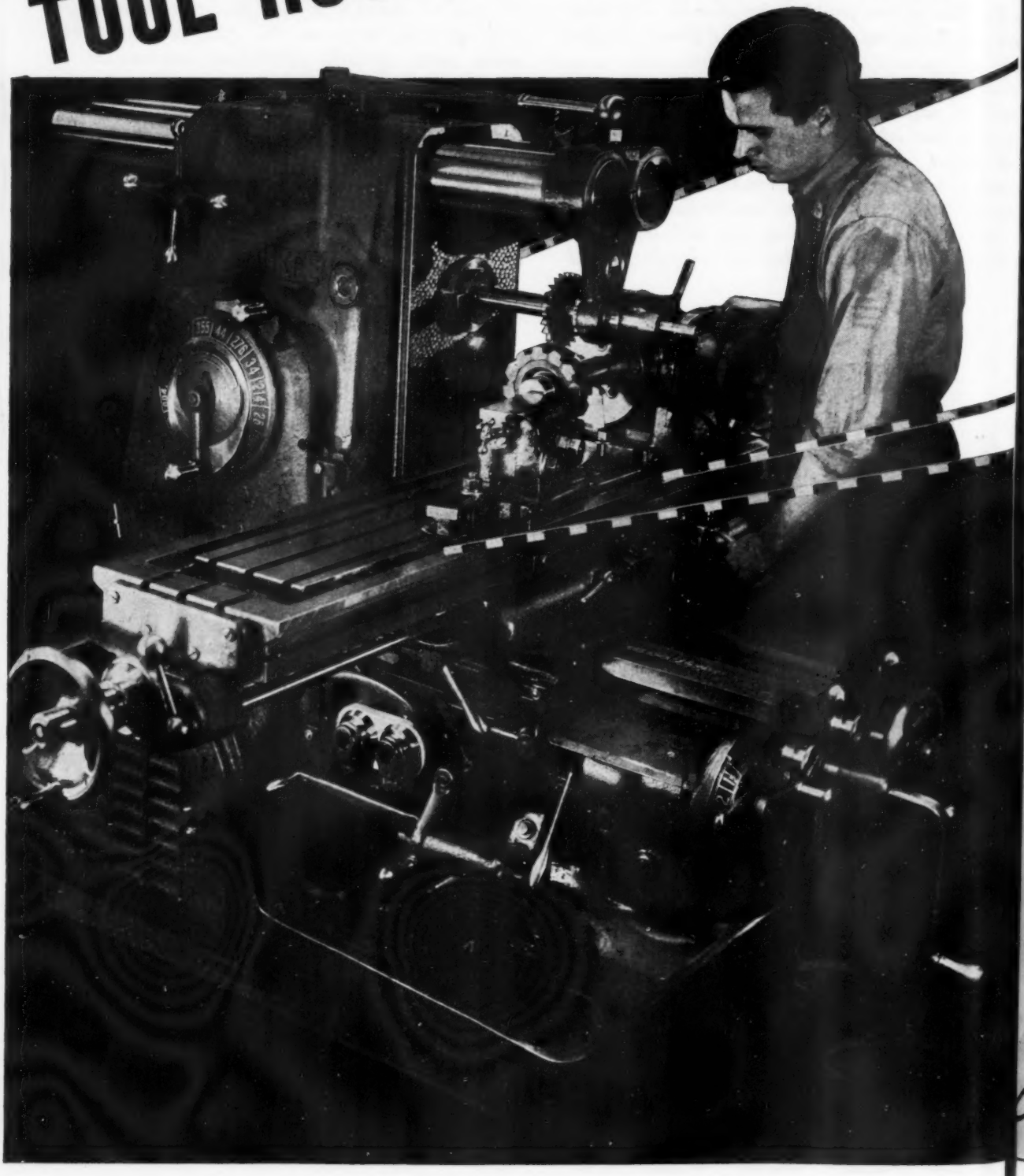
CONTRIBUTES TO VICTORY

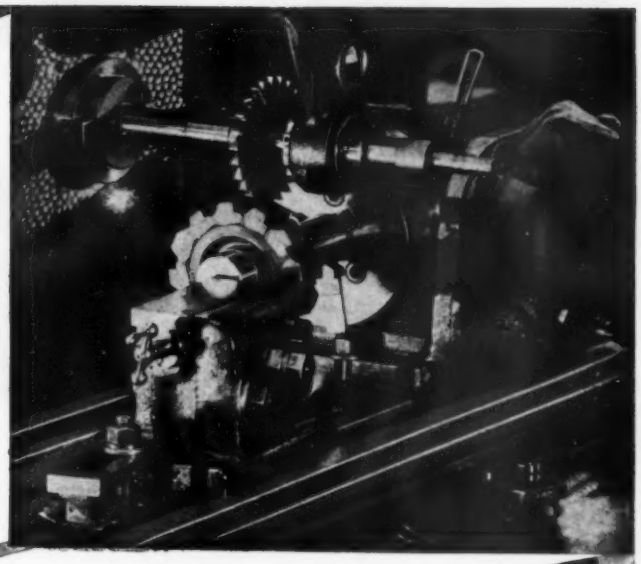
412

Make it

in your TOOL ROOM

. . . Here's Another Job Showing How Time and Trouble can be Saved by Doing it in *YOUR TOOL ROOM* —on a *MILWAUKEE UNIVERSAL*





Only a half hour to convert an old inserted-blade face milling cutter to a modern tool — fitted with tungsten carbide tips!

The job required remilling for T-C tip slots — 7° negative rake, 7° positive angle. There were four face mills in the lot — 12-tooth cutter bodies of hardened Meehanite — and only a half hour was needed to remill each cutter on a Model H Milwaukee Universal.

That's just another example of the flexibility and adaptability of Milwaukee Universals in the tool room — doing a greater variety of jobs — faster — and without special equipment.

And it's another instance of how troubles caused by tool steel shortages — long delayed delivery dates — can be avoided by remaking — reshaping — reconditioning tools on a Milwaukee Universal Milling Machine.

"BUY VICTORY WITH AT LEAST 10% IN WAR BONDS"

KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WISCONSIN

Milwaukee **MACHINE TOOLS**

Miss Wilson's feet are TIRED

The ALB... COMPANY
174... SHEET

WAR... PRODUCTION
SUGGESTION

Name Mary Wilson
Clock No. 1084
Department 68

I suggest that the girls be given a short rest period in mid-afternoon. The mornings are not so bad but I find that later in the day my feet are so tired that I just have to sit down for a few minutes and slip off my shoes. Many other girls doing machine work say the same thing.

Drop in Suggestion Box

GRINDERGRAM

Use a coarse truing on an open-grain wheel for fast stock removal and cool cutting action.

A fine truing on a reasonably coarse wheel will produce a good commercial finish.

NORTON... and...

the NORTON "doctor" offers a practical suggestion

YES, it's merely a suggestion but a worthwhile one. The Mary Wilsons might be given a training course while resting tired feet.

Production managers in some shops have found through experimentation that many workers like to "learn while resting". Motion pictures of the educational type fit into rest period programs—noon hour entertainment — foremen's meetings — workmen's gatherings and job training courses.

There are Norton instruction films developed especially for such programs. The titles are: "Cutter Sharpening", "The Cylindrical Grinder", "The Surface Grinder" and "The Grinding Wheel, Its Care and Use". While intended primarily for the education of operators of Norton grinding machines, the films nevertheless have unusual general interest. They are color films with explanations of the operations by voice.

Your nearest Norton representative or distributor can make full arrangements for showing these films in your shop at your convenience. Your employees can be "learning while resting". Literature on Norton motion pictures on request.

NORTON COMPANY, WORCESTER, MASS.

M-461

ONGRINDERS
nd Lappers

When the dam breaks

AWAITING the release of materials, machinery and man power now used in war production, is a backlog of consumer demand exceeding anything in our history. And, stored up in savings and War Bonds, are billions of dollars to pay for these goods.

This pent-up demand is a challenge to American industry. It offers us the opportunity to keep our plants running, to provide reasonably full employment, to build up peacetime sales and continued prosperity.

But, postwar buyers will not be satisfied with mediocre goods at fancy prices. They'll want sound values at reasonable cost. To give them such values, and to maintain our standards of living and wages, will require the most modern and efficient machinery.

Present equipment won't do it, in many plants. We've driven our new machines so hard in war production that we've taken years from their lives. Old equipment, continued in service because replacements were scarce, will be outmoded. Only new and modern tools, of highest efficiency, can turn out the goods the people want, at reasonable prices. Only that way can we meet this challenge.

And as we do so, earnings will accrue that will permit the cycle to be started again. New machines, new methods and new products will continue to lead to more demand, more employment, more sales and earnings.

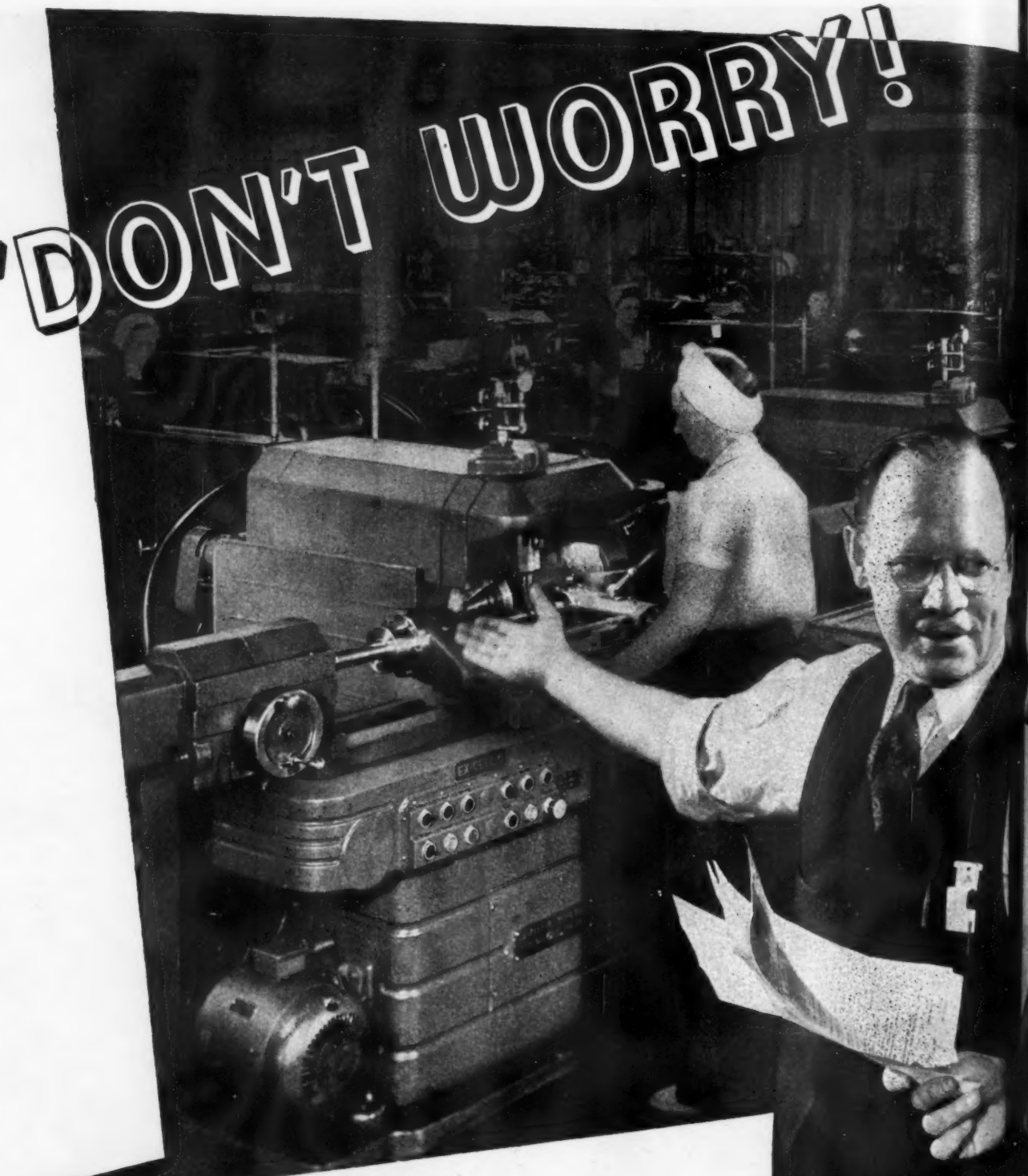
Thus our American standards will be maintained, with peace, contentment and employment for all.

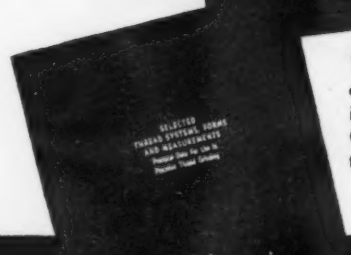
THE MONARCH MACHINE TOOL COMPANY · · · SIDNEY · OHIO

MONARCH LATHES
Save Time

S WILL YOU BE READY?

"DON'T WORRY!





To left: Ex-Cell-O book on Thread Systems, Forms, and Measurements that contains much practical information for all those using Precision Thread Grinding Machines. A request for a free copy of this new book, on your business letterhead, will be given immediate attention.

PRECISION THREAD GRINDING, BORING AND LAPPI[N]G MAC[H]
GRINDING SPINDLES · BROACHES · CONTINENTAL CUTTI[N]G TOOL
EQUIPMENT · PURE-PAK CONTAINER MACHIN[E]RY

We can get that extreme accuracy and output on these EX-CELL-O Thread Grinders"

• *Yes,* where hardened threaded work has to be accurate, and produced fast, *precision thread grinding* is the right answer. No other production threading method compares with grinding after hardening for accuracy of form, size, lead, and uniformity of finish; often the precision grinding of threads also means increased output and reduced unit cost. Ex-Cell-O, pioneer in developing the precision thread grinding process in America, has available a complete line of standard precision thread grinders—making it possible for you to select the exact type of machine required to handle your precision threaded work successfully on a profitable production basis. Write to Ex-Cell-O today for copy of new General Products catalog (Bulletin No. 27121). It contains illustrations and specifications of Ex-Cell-O precision thread grinders and information on other Ex-Cell-O precision-made products.

EX-CELL-O CORPORATION • DETROIT

Ex-Cell-O Style 39-A Precision Thread Grinder—for grinding internal threads.

LAPPI ACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS
CUTTI OOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION
ACHIN AILROAD PINS AND BUSHINGS • PRECISION PARTS

XLO
EX-CELL-O *for* PRECISION

RIVETT

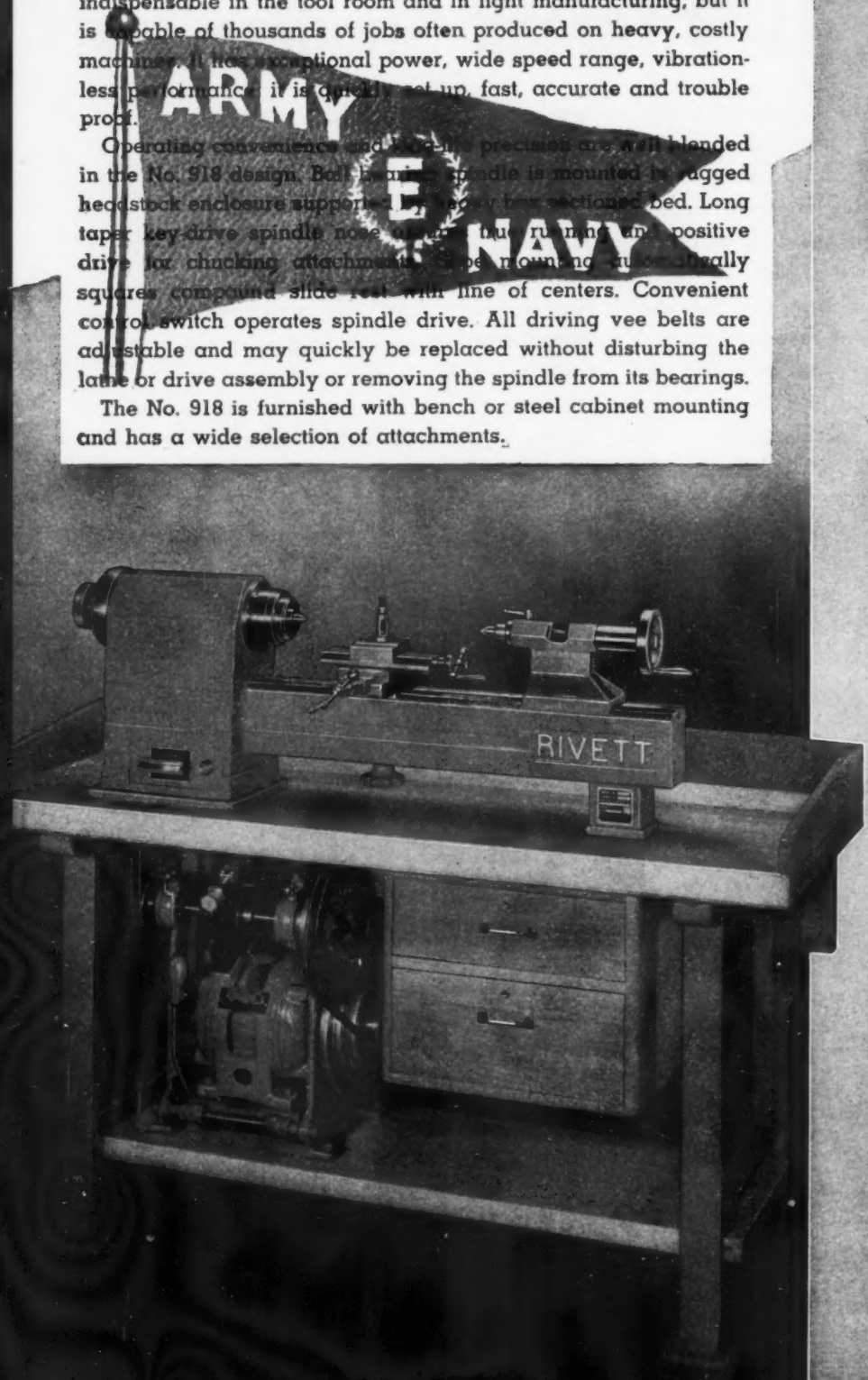
918 PLAIN BENCH LATHE

Revolutionizes Concept of Bench Lathe by Its Power and Vibrationless Performance

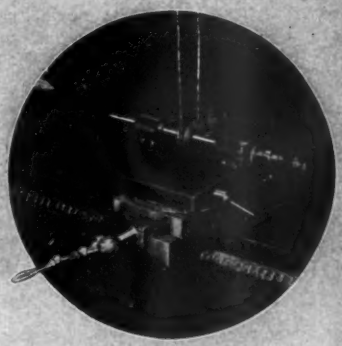
The Rivett No. 918 has been developed to advance the productive capacity of the plain precision bench lathe. Not only is it indispensable in the tool room and in light manufacturing, but it is capable of thousands of jobs often produced on heavy, costly machines. It has exceptional power, wide speed range, vibrationless performance, it is quickly set up, fast, accurate and trouble proof.

Operating convenience and [illegible] precision are well blended in the No. 918 design. Ball bearing spindle is mounted in rugged headstock enclosure supported on heavy box sectioned bed. Long taper key drive spindle nose [illegible] thus running with positive drive for chucking attachments. Shoe mounting [illegible] squares compound slide rest with line of centers. Convenient control switch operates spindle drive. All driving vee belts are adjustable and may quickly be replaced without disturbing the lathe or drive assembly or removing the spindle from its bearings.

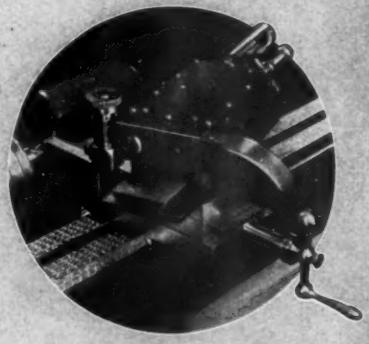
The No. 918 is furnished with bench or steel cabinet mounting and has a wide selection of attachments.



Slotting Attachment



Universal Grinding Attachment



Automatic Slide Rest

SPECIFICATIONS

Swing over bed, dia.	9"
Distance between centers	18"
Collet capacity, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Slide rest, travel of tool post slide	5¼"
Slide rest, travel of cross slide	5¼"
Tailstock spindle travel	3½"
Spindle speeds, eight forward and reverse	
Low range	150-2500 r.p.m.
High range	225-3750 r.p.m.
Weight of lathe, mounting and drive, net	850 lbs.

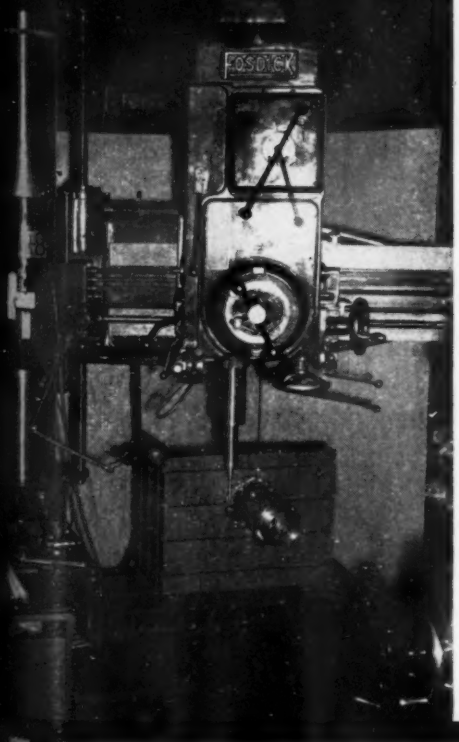
For Further Description Write for Bulletin 918

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.

ARMY E NAVY

SPEEDING PARTS FOR OUR UNDERSEA CRAFT

FOSDICK RADIAL DRILLS



The urgent need for more ships calls for a steady flow of a wide variety of parts to speed up production of vital sea craft.

This Fosdick Hydraulic Radial is drilling and counter boring 17/32" holes in parts needed for our ship building program. The machine is operating as follows—

Drill speed 700 R.P.M.

Drill feed .027

Counterbore speed 45 R.P.M.

Counterbore feed—Hand.

The hydraulic control feature facilitates operation of the rapid traverse, both column and arm clamping and safety nut. The centralized control on the head provides additional ease of operation and increases productive capacity.

For continued accuracy—versatility and high production put your radial jobs on a Fosdick Hydraulic Radial.

For full detailed information on design and construction write for Fosdick Radial Bulletin RA. No obligation.

FOSDICK MACHINE TOOL COMPANY

CINCINNATI ··· OHIO

DON'T GET CAUGHT OFF BASE

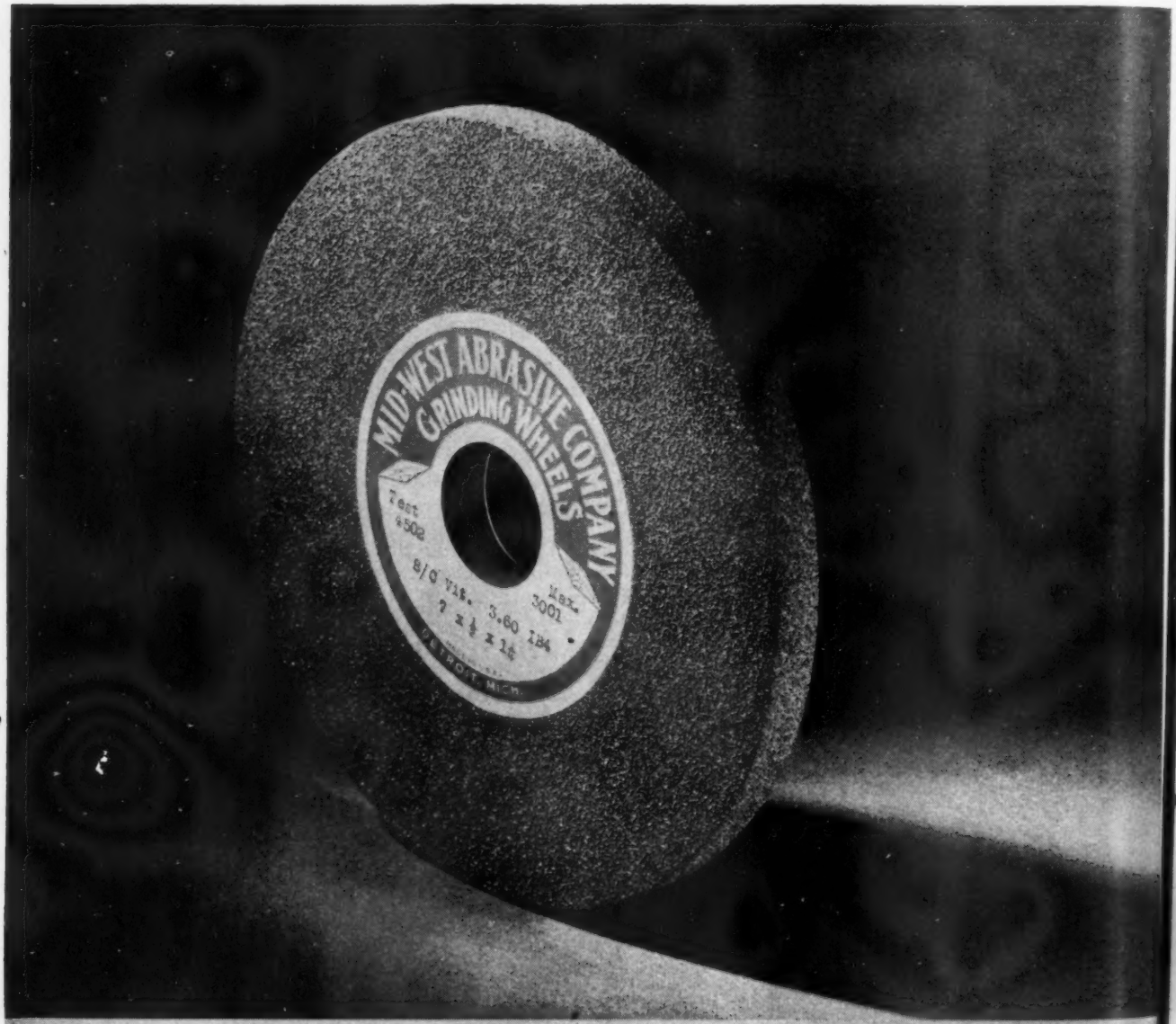
BY IMPROPERLY GRINDING CARBIDE TOOLS

Carbide tipped tools are entirely too expensive to neglect. To operate at peak efficiency they must be kept well sharpened at all times. That means frequent grinding—removing only a few thousandths each time. And grinding carbide tools is no job for an amateur.

The danger of localized heating, cracking, chipping or otherwise ruining a costly tool is greatly lessened when a MID-WEST "B" Bond wheel does the grinding. You'll find MID-WEST "B" Bond wheels cut faster, cooler and smoother because they are engineered especially for carbide grinding. Any grade. Any grain. Porous or dense. And reasonably prompt delivery.

Order "B" Bond Wheels Today—

AND WATCH YOUR TOOL LIFE LENGTHEN



MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE **DETROIT 11, MICH.**

Now Electronics Gives You Full-range Variable-speed Drive from AC *Power*

THY-MO-TROL DRIVE is easy to install. These four compact units—d-c motor, electronic panel, compact control station, and small power transformer—make up the complete drive.

G-E THY-MO-TROL DRIVE Provides Full Control on a Single Dial

Complete Drive—Nothing Else to Buy. Thy-mo-trol drive is a complete equipment, its d-c motor operating from your a-c power line. Starts, accelerates, controls speed, stops by dynamic braking, and reverses the motor—all from a single, compact control station. And it fully protects the motor.

Makes available previously unused advantages of d-c motors, such as:

1. **Full-range, Stepless Speed Control**
2. **Constant Speed under Changing Load**
3. **Full Torque at Low Speeds**
4. **Smooth, Fast Current-limit Acceleration**

Dozens of Other Thy-mo-trol Extras . . . such as: low maintenance (by elimination of moving parts); preset speed before starting; space saving; no stop for speed change; easy to control automatically; operation direct from a-c line—no motor-generator or other special d-c supply needed.

Where Has It Been Applied? Drill presses, to increase speed range and kinds of work handled. Grinders, for precise speed selection and improved finish. Milling machines, to increase variety of work handled, and to simplify design. Propeller governor testing, for accurate, smooth speed control. Cable reelers, to maintain constant tension. Conveyors, to match speeds.

How to Buy Thy-mo-trol Drive. Because electronic motor control offers so many advantages through improved machine design, performance, and operating technique, G-E engineers want to consider each of your problems as an individual case. Standard Thy-mo-trol drives can be obtained in sizes up to 10 hp. Special types can also be provided. For further information write, stating your problem, to any G-E office, or to General Electric, Electronic Control Section, Schenectady, New York.

ANOTHER G-E *"FIRST"* IN INDUSTRIAL ELECTRONICS

GENERAL ELECTRIC

676-109-8888

FOR QUICK KEMPSMITH SERVICE-- REACH FOR YOUR PHONE

KEMPSMITH DISTRIBUTORS

Akron, O.	Strong, Carlisle & Hammond Co.
Baltimore, Md.	Calco Machinery Co.
Boston, Mass.	Wiggelsworth Machinery Co.
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Montreal, Que.	Moore Bros. Machinery Co., Ltd.
Toronto, Ont.	Rudel Machinery Co., Ltd.
Windsor, Ont.	Rudel Machinery Co., Ltd.

There is a KEMPSMITH *Distributor Near You!*

If you want to tool up your milling machine for increased production, just phone the Kempsmith distributor nearest you. Kempsmith Distributors everywhere are ready to serve you and you'll find their engineers both capable and willing to help solve your machining problems.

The Kempsmith Machine Company is proud of its distributor organization. Selected on the basis of location, engineering skill, service facilities and broad technical experience, Kempsmith distributors are a vital force in the industry. Every one is a well-established, reliable concern—the kind of firm with which you like to do business.

THE KEMPSMITH MACHINE CO. • Milwaukee, Wisconsin, U. S. A.

KEMPSMITH

• Precision Built Milling • Machines Since 1888

Slab Milling Job on a Kempsmith Type "G" Machine.

Milling Circular Table Slots on a Large MAXIMILLER.

In constant service 48 hours per week at the Gould & Eberhardt plant, Irvington, N. J.

Purchased by Gould & Eberhardt, Irvington, N. J., manufacturers of gear cutting machines and shapers, to speed up cutting-off from bar stock on various grades of steel up to 6" in diameter, this MARVEL 6A high speed Production Saw has been operating 48 hours per week since installation over a year ago. When photographed it was automatically cutting identical lengths from "Maxwell" No. 3½ hot rolled natural steel 2⅝" diameter. The actual cutting time per piece, using a 6 tooth MARVEL High-Speed-Edge Hack Saw Blade, was 1 minute 15 seconds.

ARMSTRONG-BLUM MANUFACTURING CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE CHICAGO, U. S. A.

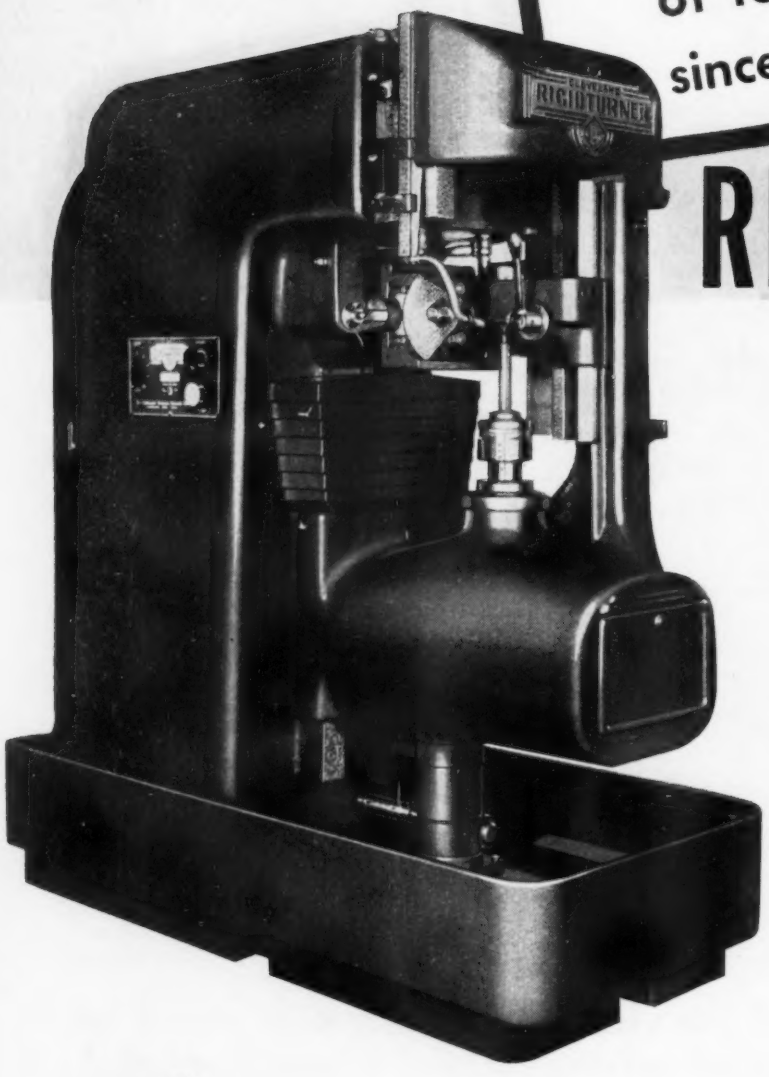
Eastern Warehouse and Sales: 225 Lafayette St., New York, N. Y.

MARVEL SAWS

HOW'S THIS FOR A SCRAP RECORD?

THE WAYNE PUMP COMPANY reports a scrap record of less than ½ of 1% since they started using

RIGIDTURNERS



THIS IS A PHENOMENAL RECORD and demonstrates the economy of using the Rigidturners for accurate duplication multiple diameters

SIMPLICITY OF OPERATION

● The work advances past the cutter which is rotated in variable timed relation to produce various diameters. Operator merely loads machine, presses button and machine completes the operation and stops . . . ready for reloading.

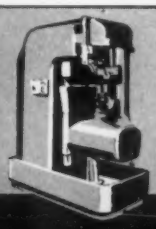
HIGH PRODUCTIVE CAPACITY

Capable of precision duplication on a high production basis the Rigidturner is meeting the urgent demands for all out war production today. And tomorrow when costs are an item to be reckoned with, Rigidturners can and will be quickly converted to peacetime operation due to their high productive capacity – precision – and savings they effect.

The Rigidturner is also built in the 8-Spindle Rotary model for mass production of multiple diameter work requiring close accuracy and faithful duplication.

Consult C.H. Engineers on your turning work now.

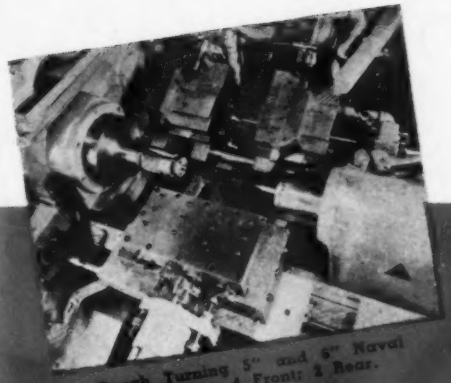
THIS BULLETIN tells how the Rigidturner operates—what work it will handle and how it can save you time and costs on turning multiple diameter work. Write for yours today.



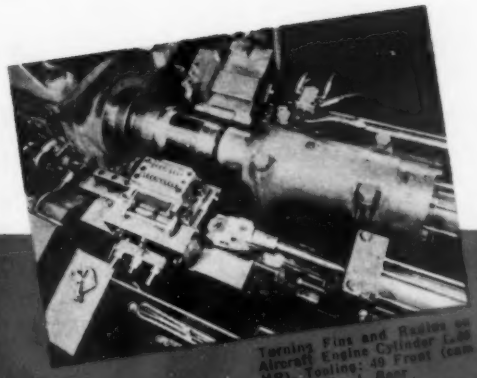
The CLEVELAND HOBBING

Cleveland ... MACHINE Company ... Ohio

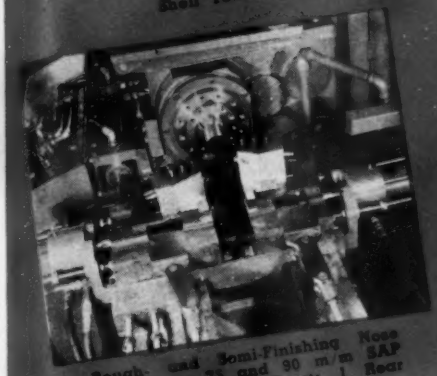
BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS



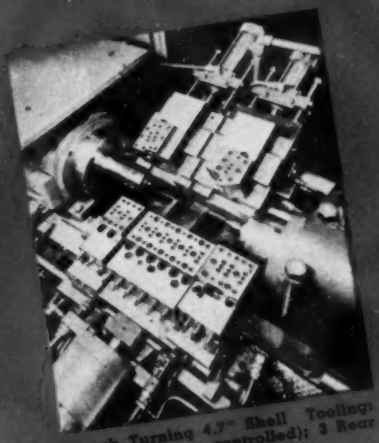
Rough Turning 5" and 6" Naval Shell Tooling: 4 Front; 2 Rear.



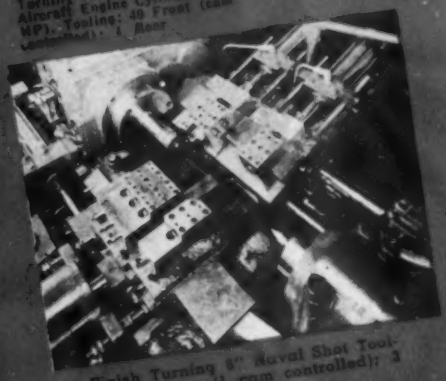
Turning Fins and Recess on Aircraft Engine Cylinder (450 HP). Tooling: 40 Front (cam controlled); 4 Rear



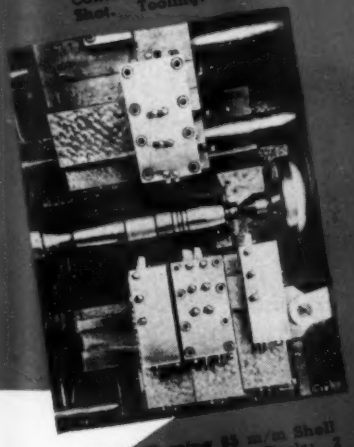
Rough- and Semi-Finishing Nose Contour on 75 and 90 m/m SAP Shot. Tooling: 2 Front; 1 Rear



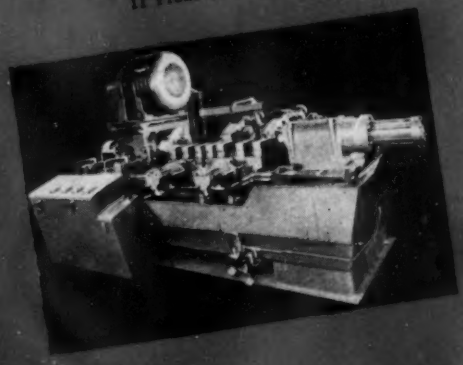
Rough Turning 4.9" Shell Tooling: 11 Front (2 cam controlled); 3 Rear

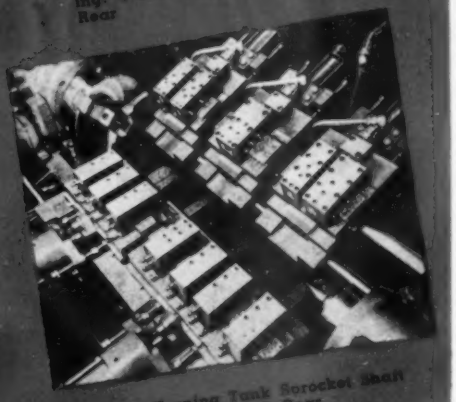


Finish Turning 6" Naval Shot Tooling: 4 Front (1 cam controlled); 3 Rear



Finish Turning 85 m/m Shell Tooling: 4 Front Tools; 2 Rear





Finish Turning Tank Sprocket Shaft Tooling: 8 Front; 8 Rear

ADAPTABILITY TO MULTIPLE TOOLING SET-UPS ASSURES PRODUCTION SPEED-UP WITH THE SPARKS SEMI-AUTOMATIC HYDRA-FEED LATHE

Shown here are a few of the many tooling set-ups on the SPARKS lathe which make it adaptable to a wide variety of work.

The SPARKS is a mass production machine of outstanding capabilities through the combination of multiple tooling with the use of hydraulic power to produce and control inter-related tool movements.

Detailed information on the set-ups illustrated is available in SPARKS engineering bulletins—sent promptly on request.

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.

Tomorrow's Press-- TODAY!

The Press illustrated has two connections one at each side of slide. Other Presses of this type are Single Point—one connection, and Four Point—four connections.

Modern Cleveland Presses, which are now being used extensively in the war effort, incorporate many features applicable to "after war" production.

In these Presses, the gears, flywheel and drive unit are located in the box type crown, thus eliminating all overhanging gears and other projections, and conserving valuable floor space.

The pneumatically or hydraulically operated friction clutch is electrically controlled by one or more stations and the counterbalance for the slide is located in the upright.

This type of Press can be furnished in Single Point having one connection, Two Point having two connections or Four Point having four connections, in sizes and capacities to suit particular requirements.

THE CLEVELAND PUNCH & SHEAR WKS CO. U. S. A.

THE CLEVELAND PUNCH & SHEAR WORKS CO CLEVELAND · OHIO

One way trip...to death!

A DEVASTATING MIGRATION occurs at irregular intervals in Norway. Countless hordes of rodents, known as "lemmings," emerge from nowhere. They seem to be led by some invisible Pied Piper.

They travel in parallel lines three feet apart, straight through hay and corn stacks, across mountains instead of around...on and on to the brink of the sea. But they don't stop there. They swim straight to a point miles out in the ocean. Then they swim in circles until they drown!

Several theories have been advanced about the fatal pilgrimages of lemmings, but the most likely one is that they are searching for an island which no longer exists. It is an age-old custom: blindly attempting to live by landmarks which disappeared long ago.

The custom is represented by men who hooted at automobiles—by the men who laughed at Wright—and by the men who said democracy couldn't compete with a dictatorship. Happily, those men can be belied by a reliable index—that of the machine tool industry.

We gave Germany a 7-year head start, and passed her in about a year. For every one machine tool produced today by the Nazis, **we are now producing 5.**

The Conomatic, a key machine of peacetime industry, is well known to the production men of America. Those with their eye on the future are already thinking in terms of peacetime production—after victory is won—with Cone Multiple Spindle Automatic Lathes.

CONE Automatic Machine Company, Inc., Windsor, Vermont

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button

The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

DE VLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

UNION

FOR ACCURACY THAT LASTS ON TOUGH WARTIME JOBS!

In today's war production, accuracy is doubly important, and the LONG-LASTING ACCURACY of Union Tools is helping to make wartime jobs economical as well as efficient. In these days of tool shortages, priorities and scarcity of labor it is important not to waste tools, materials or time.

Buy Union Tools. You'll find that with proper care they'll give you longer accurate service that means real tool economy.

The Tools You Buy Again!

Divisions of the

UNION TWIST DRILL CO.

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S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
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New York: 61 Reade St.
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UNION BUTTERFIELD CARD

CARD

QUALITY TAPS

FOR WARTIME SERVICE

Under present demands for quantity production, quality must be maintained! When the pressure is on to turn out more and more war materials, Card Taps reveal their inherent ability to turn out high quality work on a high production basis. Whatever degree of accuracy you demand . . . whatever material you work in, Card can supply the Taps for quality war production.

Divisions of the
UNION TWIST DRILL CO.

S. W. CARD MFG. CO.
MANSFIELD, MASS.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
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San Francisco: 121 Second St
Los Angeles: 524 E. Fourth St
Seattle: 568 First Ave., South

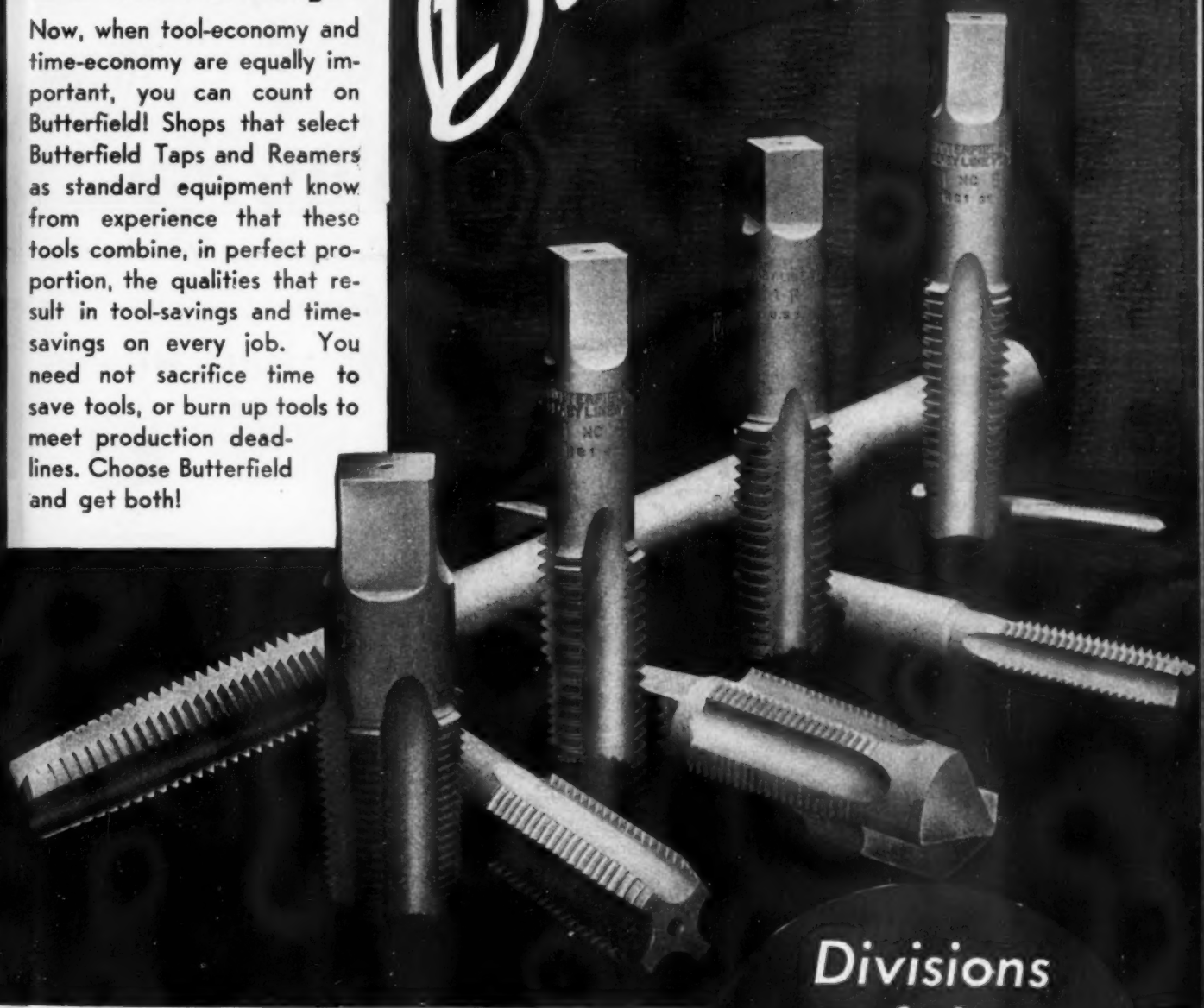
UNION BUTTERFIELD CARD

CHOOSE

Butterfield

For Tool-Economy and Time-Savings!

Now, when tool-economy and time-economy are equally important, you can count on Butterfield! Shops that select Butterfield Taps and Reamers as standard equipment know from experience that these tools combine, in perfect proportion, the qualities that result in tool-savings and time-savings on every job. You need not sacrifice time to save tools, or burn up tools to meet production deadlines. Choose Butterfield and get both!

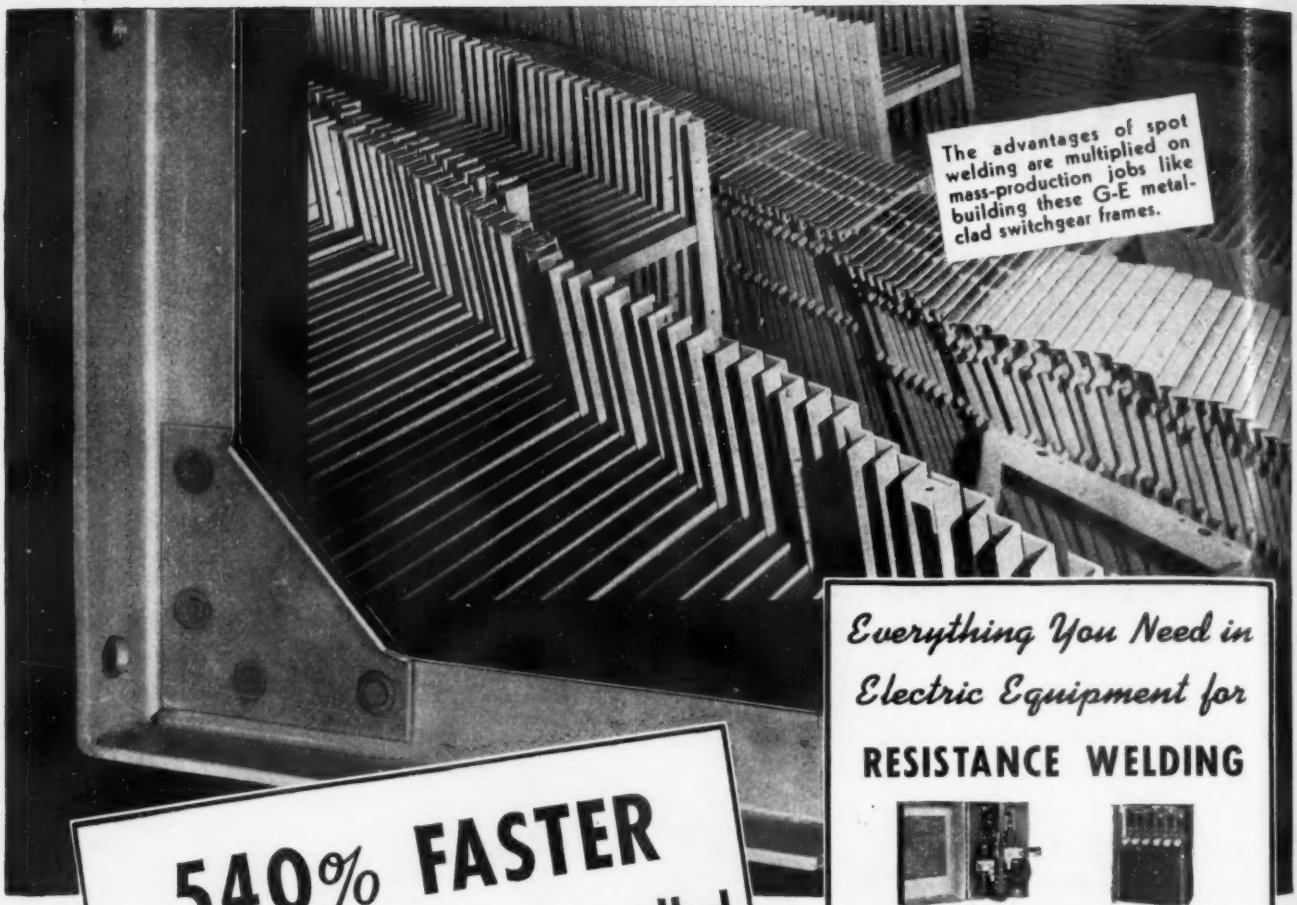


Divisions of the UNION TWIST DRILL CO.

BUTTERFIELD DIVISION
DERBY LINE, VT. ROCK ISLAND, QUE.

STORES: New York, 61 Reade St. Chicago, 11 So. Clinton St. Cleveland, Hal. W. Reynolds, 3346 Superior Ave. Detroit, 6540 Antoine St. Los Angeles, 524 E. Fourth St. Toronto, 137 Wellington St., West. Montreal, 111 St. Paul St., West. Winnipeg, 403 Travellers Bldg. Vancouver, 327 Shelly Bldg. Agents for Great Britain—Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S.E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

UNION BUTTERFIELD CARD


The advantages of spot welding are multiplied on mass-production jobs like building these G-E metal-clad switchgear frames.

540% FASTER
with Electronically Controlled SPOT WELDING

SPOT-WELDING the thousands of corners for G-E switchgear enclosures speeded production 540 per cent over riveting; 375 per cent over bolting. Spot welding eliminated punching holes, inserting rivets or bolts, and the riveting or bolting operations—saving time, material, and man power.

Electronically controlled resistance welding is speeding the construction of light-metal and stainless-steel aircraft. It's replacing soldering, too, saving tin and time. Joining like or unlike metals and alloys. Giving dependable, *consistent* results. Making gastight seams. Helping speed the training of new operators. Resistance welding is ideal for high-production operations on heavy or light work, portable or fixed.

Whatever your application, be sure to specify G-E electronic control and other electric accessories. For further information, contact any G-E office, or your resistance-welder manufacturer or agent. Or write General Electric, Schenectady, N. Y.

Everything You Need in Electric Equipment for

RESISTANCE WELDING

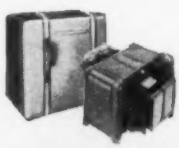
Electronic controls for spot and seam welders

Electronic weld and sequence timers

Weld-recorders—to record electrical input of EVERY weld

Electron tubes for all purposes

Cables and instruments



Air circuit breakers and welding transformers

Capacitors for power-factor improvement

Motors and control

Speed Production Electronically

GENERAL ELECTRIC

TRADE-MARK
Thompson
REG. U.S. PAT. OFF.

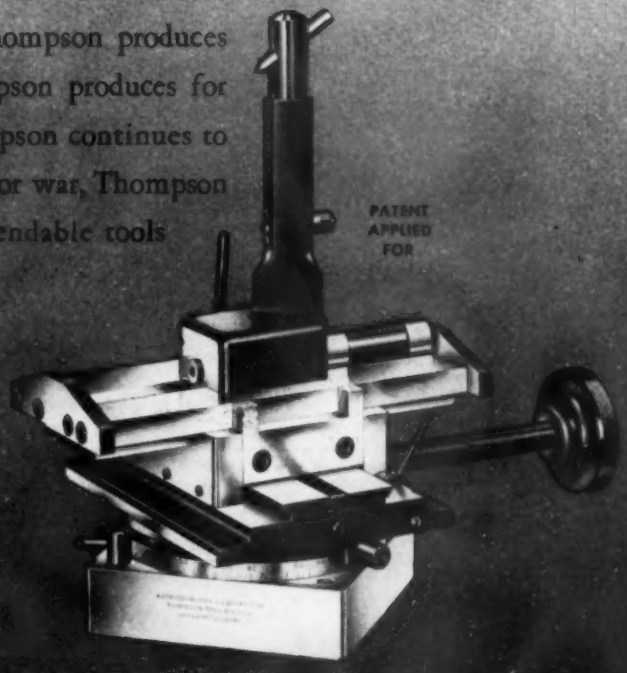
Announces a New

UNIVERSAL

Radius Dresser

Again Thompson produces — a better Radius Dresser — precision made. Thompson produces for our armed forces—Thompson produces for our production forces—Thompson continues to produce and improve. In peace or war, Thompson will show the way with dependable tools — produced on time.

Write for further information on this New Thompson Universal Radius Dresser.



ARMY E NAVY

Awarded to Auto-Ordnance Corporation for excellence in production of "Tommy" Guns.

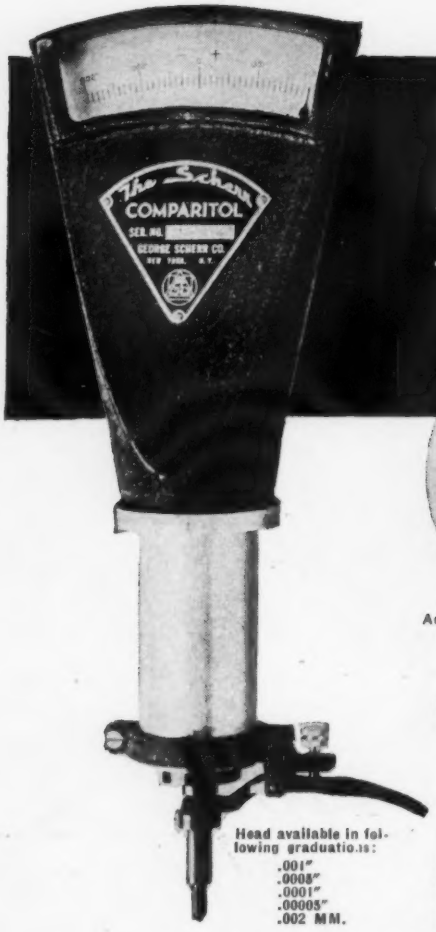
AUTO-ORDNANCE
CORPORATION
THOMPSON TOOL DIVISION

342 WEST PUTNAM AVENUE, GREENWICH, CONN.

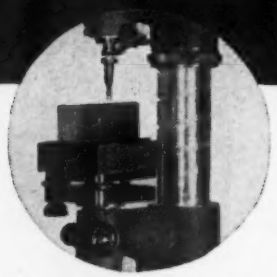
COMPARITOL

MEASURING HEADS AND ATTACHMENTS

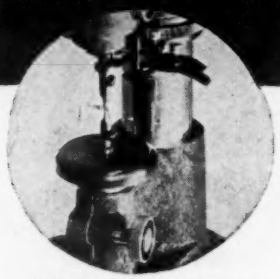
. . . now available to facilitate checking and inspection on a wide range of work



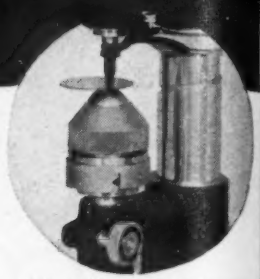
Head available in following graduations:
.001"
.0008"
.0001"
.00005"
.002 MM.



Adjustable Tilting Table Attachment



Knife Edge Attachment for checking extremely fine pivots and parts for watches, aircraft instruments, etc.



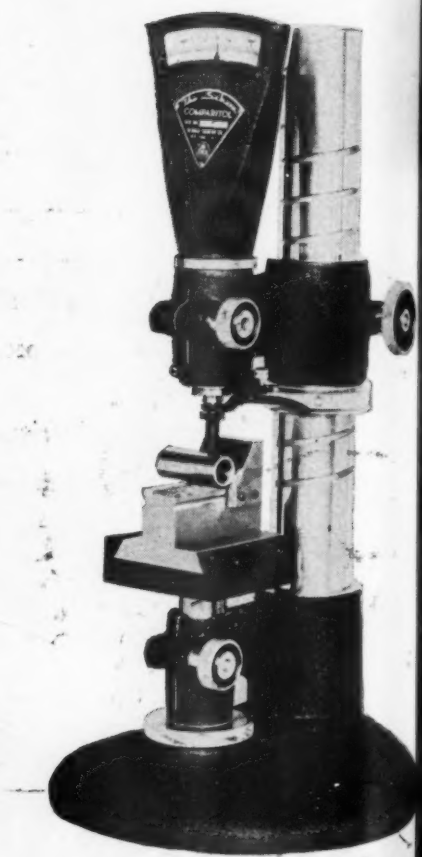
Ball Anvil Attachment for measuring extremely thin and flat pieces such as quartz crystals, laminations, etc..

VISUAL READINGS TO $\frac{1}{10{,}000"}$

Outstanding acceptance of the SCHERR COMPARITOL for precision inspection of plug gages, cylindrical work, screw machine parts and other purposes has pointed to many other possible and practical uses. In order to simplify the adaption of the Comparitol to these uses and thereby extend its utility, we are now prepared to furnish the Measuring Head only for building into fixtures for special measuring applications as well as several special attachments for specific work. If you have a special adaptation in mind, we suggest your getting in touch with us and asking for our recommendations.

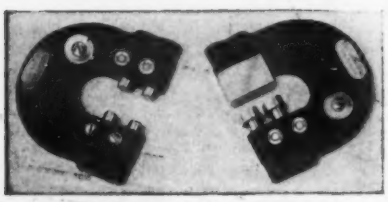
Regardless of its use, the SCHERR COMPARITOL provides visual readings on a scale graduated to .0001"; range is .004" plus and minus. Accurate readings are assured by any operator skilled or unskilled because with the Comparitol the human factor is eliminated in measuring and inspecting. On a given piece of work the same reading will be made each time by any inspector.

It will pay you to explore the possibilities of the SCHERR COMPARITOL and its various attachments as a means of handling your inspection and checking jobs. Complete information available promptly on request.



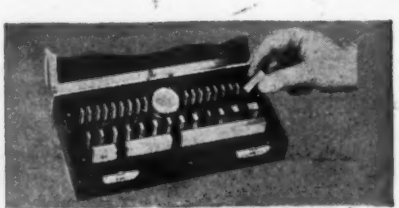
Price $195.00

OTHER INSTRUMENTS IN THE SCHERR LIMITED BUDGET INSPECTION LABORATORY



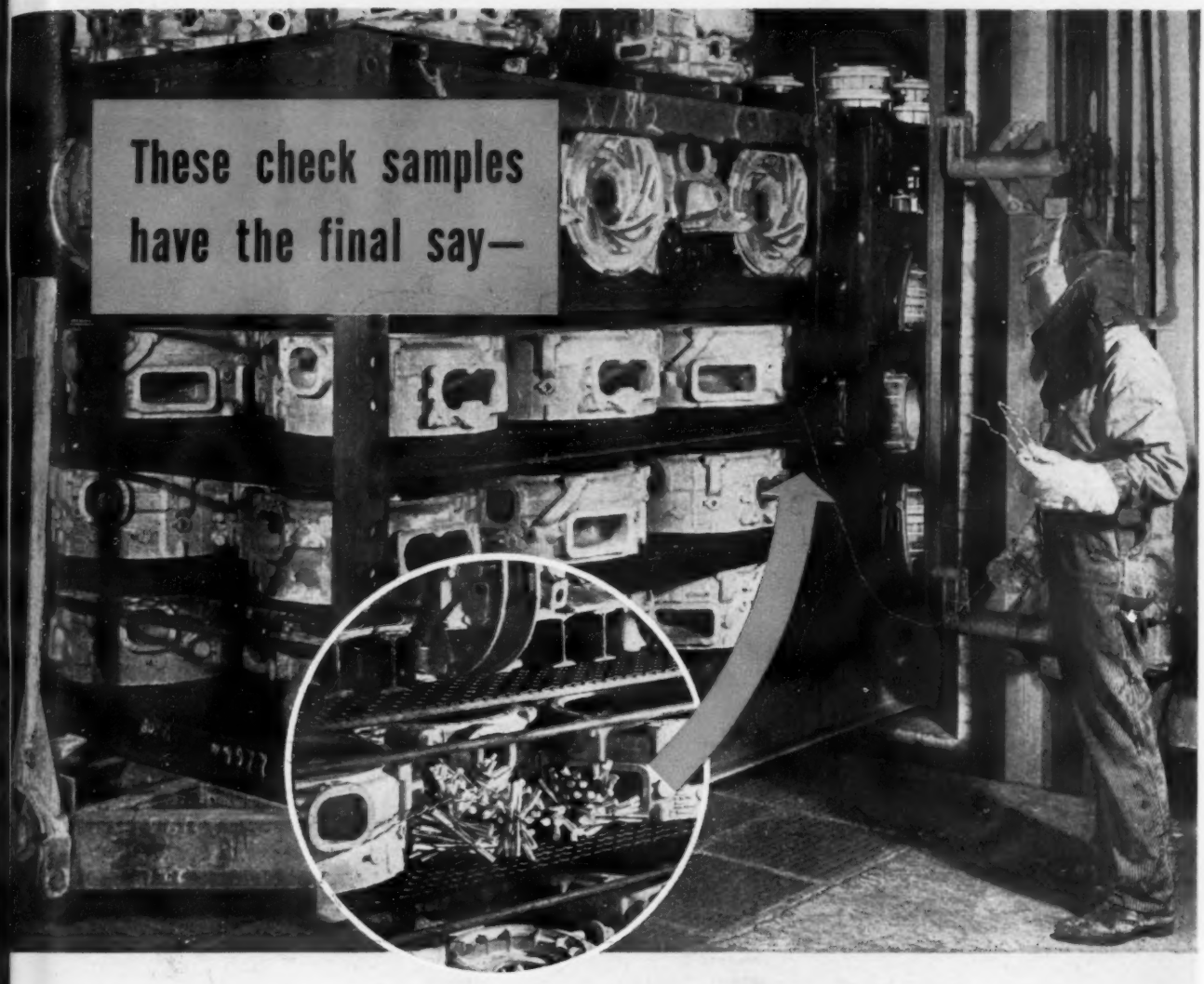
ATLANTIC ADJUSTABLE LIMIT SNAP GAGES provide accurate checkup without having to depend on operator's skill. Sizes to 6".

MAGNI - RAY a wide-field illuminated magnifier providing a means for close inspection of work and operations. Price $18.50.



ULTRA-CHEX—a 34 block set accurate to .000008", provides a basic standard of measurements. Price $125.00.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.



SO MUCH depends upon the heat treatment given magnesium castings!

In American Magnesium foundries they recognize this fact to the extent that all charges going into the furnaces carry test bars representing each batch heat treated. It's not enough to trust to skilled workmen employing practices backed by more than twenty years experience, accurately controlled temperatures and protective atmospheres in the furnaces. Those checking samples must test "O. K." before the castings are approved for shipment.

Structural properties . . . toughness, yield strength and hardness . . are improved by proper heat treatment. Castings supplied to you by American Magnesium Corporation are heat treated *right*. Your products have the lightness which magnesium alloys give them, plus Mazlo dependability.

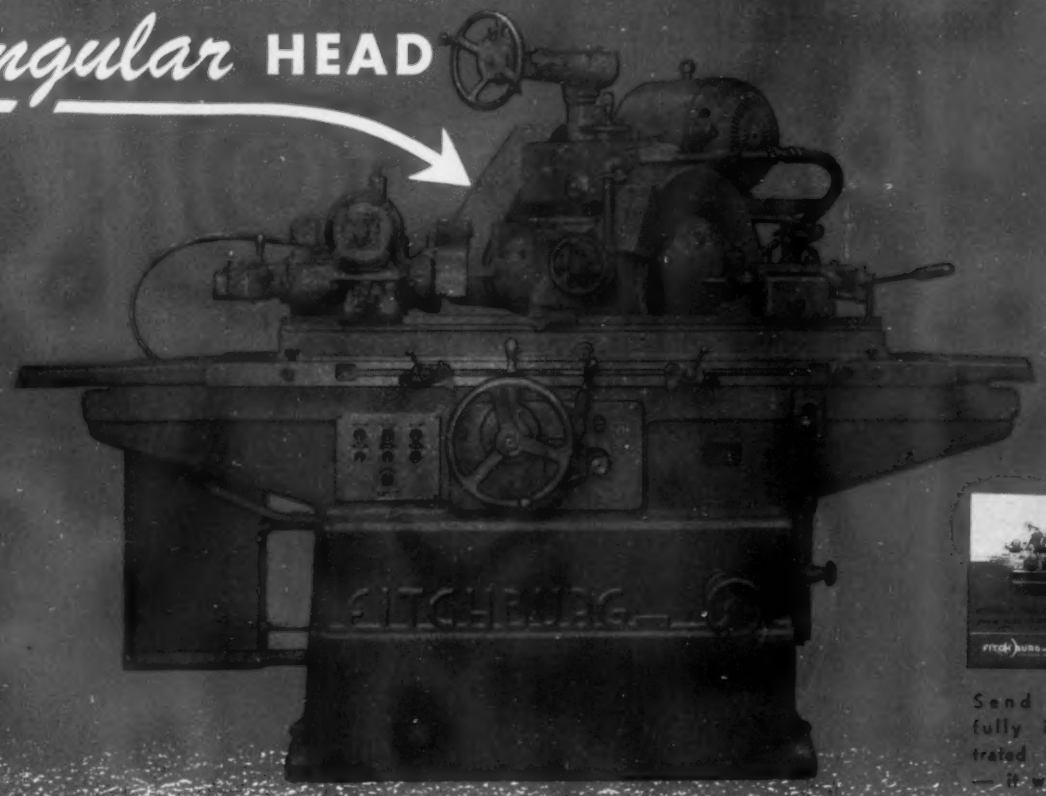
American Magnesium Corporation pioneered in controlled atmosphere heat treating for magnesium, starting in 1926. Today, all our furnaces carry an atmosphere of dry sulphur dioxide as protection for casting surfaces . . . another example of the constant drive for higher quality by the makers of Mazlo Magnesium Products. Sales Agent: Aluminum Company of America, 1702 Gulf Building, Pittsburgh, Pa.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

A GENERAL PURPOSE CYLINDRICAL GRINDER WITH ADJUSTABLE *Angular* HEAD



Send for fully illustrated folder — it will be mailed free.

This latest of Fitchburg plain cylindrical grinders, the Type "C" Angular Head Grinder, is designed to handle a wide range, and a number of types of jobs. It will cut grinding time and grinding costs.

The Fitchburg Type "C" Angular Head Grinder is adjustable. It has a standard Wheelhead Unit mounted so that it may be located to grind from 0 degrees to a 45-degree angle. The Bowgage head can be swivelled to various positions for standard plain cylindrical grinding, providing a wider range of grinding.

The Fitchburg Type "C" is completely automatic, the workhead is adjustable for various lengths of work and the work spindle can be equipped for single or variable work speeds.

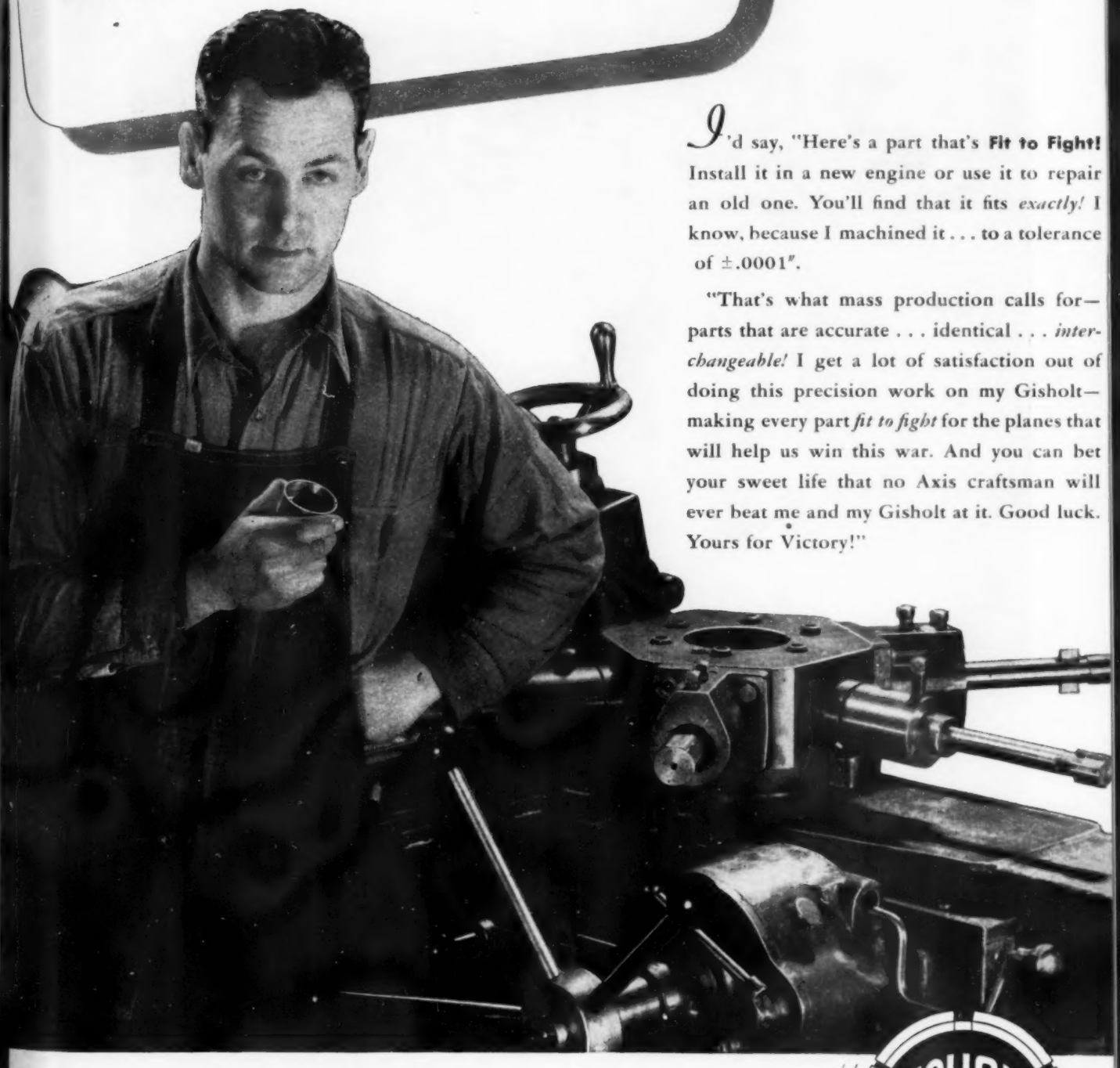
The Fitchburg Type "C" Grinder is designed to meet wartime production speed and maintain highest efficiency. In every detail it meets all the requirements of plain cylindrical and taper grinding — in large or small lots of work, with assured accuracy and fine finish, at low cost. Write for complete information today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

I'D LIKE TO SEND A NOTE WITH THIS!

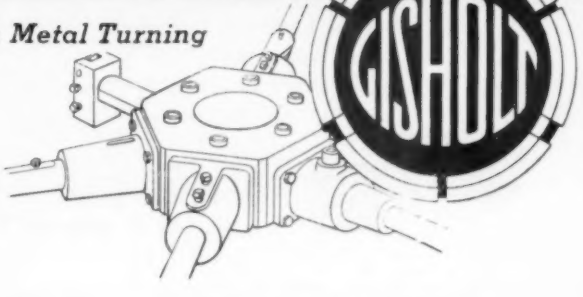


I'd say, "Here's a part that's **Fit to Fight!** Install it in a new engine or use it to repair an old one. You'll find that it fits *exactly!* I know, because I machined it . . . to a tolerance of ±.0001".

"That's what mass production calls for—parts that are accurate . . . identical . . . *interchangeable!* I get a lot of satisfaction out of doing this precision work on my Gisholt—making every part *fit to fight* for the planes that will help us win this war. And you can bet your sweet life that no Axis craftsman will ever beat me and my Gisholt at it. Good luck. Yours for Victory!"

Look Ahead..Keep Ahead..With Gisholt Improvements in Metal Turning

At Gisholt, the Army-Navy "E" and the Treasury Flag fly side by side



GISHOLT MACHINE COMPANY
1201 East Washington Ave. • Madison, Wis.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

SOUTH BEND LATHES

BUY
WAR
BONDS

ARMY E NAVY

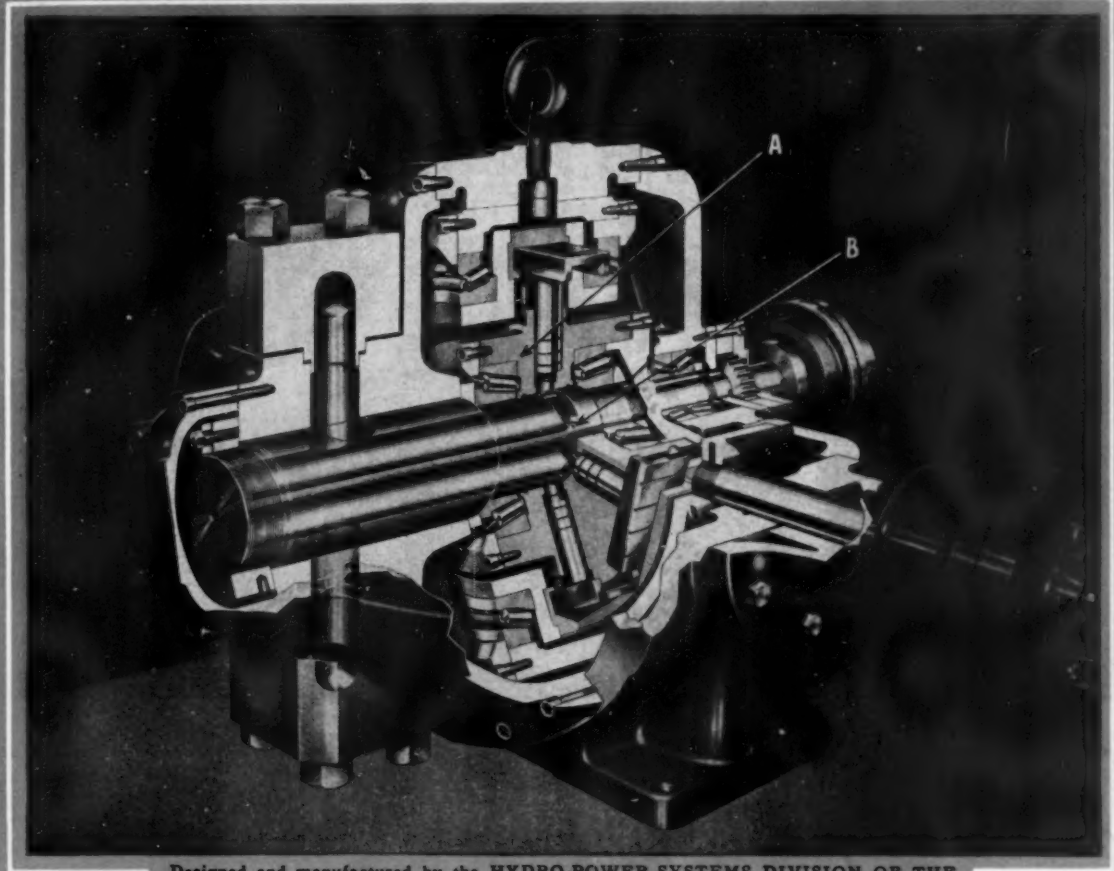
War production demands uniform accuracy. Loss of time or the waste of scarce strategic materials because of variations in machining cannot be tolerated. There is no place in our war production plan for equipment that cannot be relied upon to maintain required tolerances.

Sound design and careful workmanship give South Bend Lathes the dependable precision that assures uniform accuracy. Built by skilled craftsmen who take pride in their work, they are capable of maintaining split-thousandth tolerances on all work within their capacity. Their unvarying performance speeds production on the most exacting machine operations and assures perfect interchangeability of parts and units.

There is a South Bend Lathe for most war production requirements. The Engine Lathes are made in 9″, 10″, 13″, 14½″, and 16″ swings, with bed lengths from 3′ to 12′. The Toolroom Lathes are made in 10″, 13″, 14½″, and 16″ swings, with bed lengths from 3′ to 8′. The Turret Lathes are made in 9″ and 10″ swings, with 3½′ bed lengths. These lathes are described in Catalog 100C which will be sent upon request.

SOUTH BEND LATHE WORKS

SOUTH BEND, INDIANA • LATHE BUILDERS FOR 36 YEARS



Designed and manufactured by the HYDRO-POWER SYSTEMS DIVISION OF THE HYDRAULIC PRESS MANUFACTURING COMPANY, MOUNT GILEAD, OHIO.

DEPENDABLE POWER FOR HYDRAULIC PRESSES *with the* H-P-M TIMKEN BEARING EQUIPPED PUMP

Above is shown a cut-away view of the latest model H-P-M HYDRO-POWER Radial Hydraulic Pump—dependable source of power for presses and all kinds of hydraulically-operated machines. These pumps are noted for long service at high and constant volumetric efficiency. This depends upon maintenance of precision relationship (minute working clearance) between the high-speed rotor (A) and stationary valve pintle (B). Should these parts be permitted to get out of alignment or contact each other, the efficiency and life of the pump would be greatly reduced. To prevent such possibilities, both the rotor and the valve pintle are mounted on Timken Tapered Roller Bearings of extreme precision. This assures preservation of the original operating clearance; freedom from rotor friction; and full protection against radial, thrust and combined loads—therefore greater endurance. Furthermore, should a slight amount of wear develop after years of continuous operation, the bearings can be adjusted with hair-splitting accuracy without dismantling the pump or even removing it from the machine. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

Work for Victory—but prepare for the aftermath of competition by redesigning your machines to meet any challenge.

Guiding THE INDUSTRIAL SAMSON

Speedy and flexible control over a wide working range is the key to the productive power inherent in the modern machine tool. In the past, multiple drives, manual controls and other complicated means provided the solution to the problem of guiding these Industrial Samsons. More general use of cemented carbide cutters, to meet wartime demands for increased speeds and feeds, obsoleted such methods.

Typical of machine tool control requirements is that of a combination horizontal boring, milling and drilling machine. The feed speed selected must be constant, regardless of hard spots and blow holes or interrupted cuts. In addition, there should be a wide range of feed speeds available so that the operator can easily select the proper feed for a given alloy, and adjust the feed over the entire range without interrupting production.

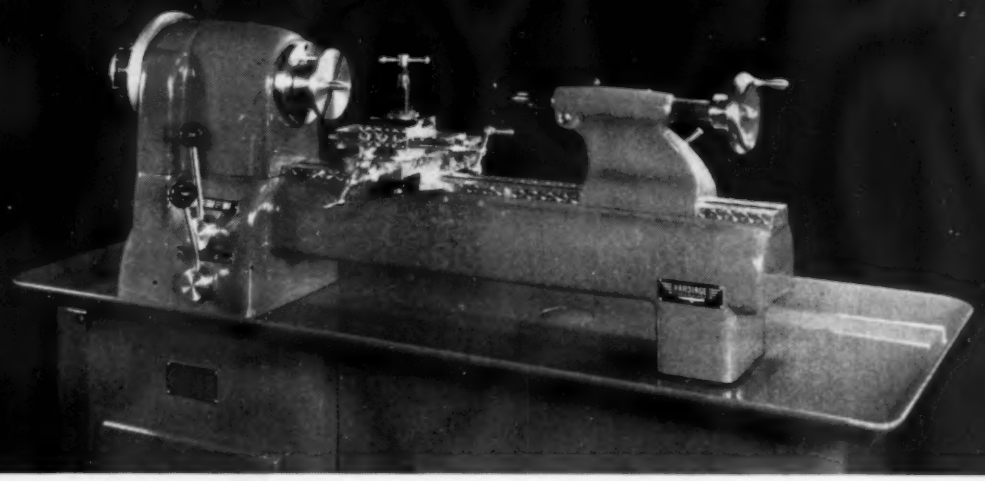
The Westinghouse solution to this complex problem is conversely simple: The use of a Rototrol maintains exceptionally close speed regulation regardless of load. A speed range of 120:1 permits a quick and convenient setting of cutting speed and, in addition, smooth rapid traverse is provided without additional equipment.

THE MACHINE IN MACHINE TOOLS

This ability to provide simple electrical solutions to complex mechanical problems is yours for the asking. Just call your nearest local office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania. J-94573

Westinghouse

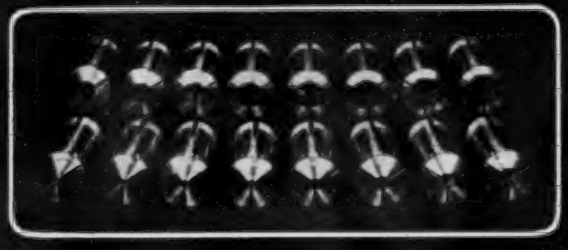
PLANTS IN 25 CITIES OFFICES EVERYWHERE



UNUSUAL CAPACITY describes the HARDINGE High Speed Precision Lathe

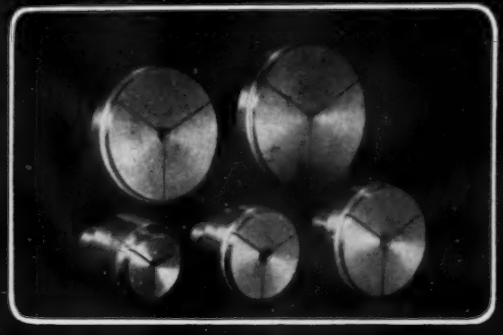
Enthusiastic users are familiar with the precision qualities of the HARDINGE High Speed Precision Lathe. They know the adaptability to a wide range of work. The modern design, preloaded ball bearing spindle construction and ease of operation all contribute to greater efficiency.

1" COLLET CAPACITY



1/16" to 1" in any fractional or decimal size. The set of Collets illustrated is by 16ths only. Special shape and stop type Collets are also furnished.

6" STEP CHUCK CAPACITY



2", 3", 4", 5" and 6" Step Chucks and Closers are used with this machine. These Chucks are operated by the same draw spindle that operates the Collets. Furnished split only – customer applies desired step or steps.

5" JAW CHUCK CAPACITY

Universal and Independent Jaw Chucks applied to the spindle nose have a 5" capacity. The Chucks embody the Hardinge feature of integral mounting which decreases overhang and increases accuracy.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

LINES BEHIND THE LINES

FROM RANGES, REFRIGERATORS AND RADIOS . . . TO BOMBS, SHELLS AND TORPEDOS . . . THE APPLIANCE INDUSTRY CONVERTS TO WAR!

Skilled as it is in the manufacture of complex small parts assemblies, the appliance industry utilizes, in war as in peace, the most efficient production methods available. Broaching is high on its list as a better way to do many metal-working jobs—the only *right* way to do some!

UPPER RIGHT. Broaching the diagonal slot in this brass fuse part is typical of the production-with-precision work required. Using an American 16" Rotary Machine, with 8-station fixture designed for manual loading, automatic clamping and automatic discharge, extremely high output is obtained.

LOWER LEFT. American broaching engineers designed this fixture to locate and index the part from three holes, with further support by recessing part in toughened steel block to minimize burr. American's *complete* broaching service —machines, tools, and engineering—contributes mightily to winning war production, profitable post-war production.

BROACHING IS BETTER

THE *American* WAY

American

BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILL.

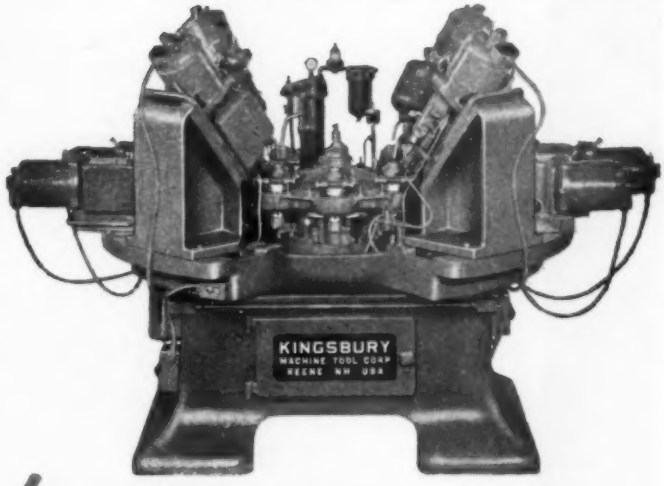
FLEXIMATIC

Demonstrates its Speed and Accuracy on Fuse Part Production

Drilling, counterboring and tapping brass fuse part components—doing the entire job in a single chucking of the work—producing 500 completed parts per hour! Jobs like this, that demonstrate FLEXIMATIC speed, simplicity and accuracy, are the reason why FLEXIMATICS are so widely chosen for intricate operations on munitions parts.

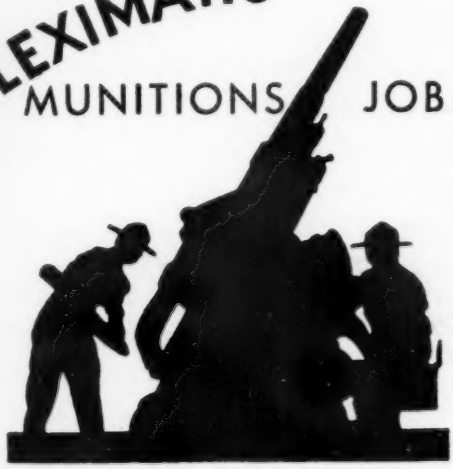
Kingsbury FLEXIMATICS are made up of standard units mounted on one of several types of standard bases. This method greatly lowers the cost of special machine construction and, in addition, permits changes to be readily made to meet changes in production. In the FLEXIMATIC illustrated, individual work holding fixtures in the turret are automatically indexed during the indexing of the main turret, thus presenting the part in various positions at the work stations so that all the operations are performed in a single chucking.

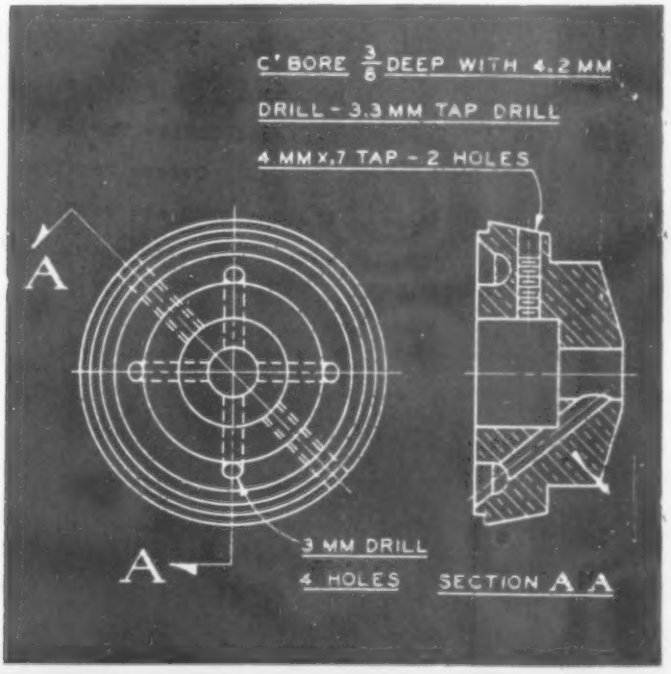
To meet the exacting standards of accuracy and the imperative need for speed in munitions production, choose FLEXIMATICS by Kingsbury!



by KINGSBURY

THIS IS A FLEXIMATIC MUNITIONS JOB!





KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

A Letter FROM THE FILES OF A SATISFIED CUSTOMER

20316 HOOVER ROAD — PROSPECT 1844-47

CADILLAC GAGE COMPANY
DETROIT
MICHIGAN
THREAD RING AND PLUG GAGES
AND
THREAD CHECKING EQUIPMENT

June 28, 1943

Parcell and Bauer Products Company
8016 Prairie Avenue
Detroit, Michigan

Gentlemen:

Thank you for your Purchase Order No. B-7828, received by phone this morning, covering a number of different sizes of standard thread plug gages. These gages were shipped this afternoon and should be in your plant tomorrow morning.

You may be interested to know that we maintain a stock of approximately 10,000 standard thread plug gages in stock and are able to make immediate shipment on almost all sizes in National Fine or National Coarse thread series.

Orders received by phone or wire are shipped the day they are received. A confirming purchase order with a priority should be mailed for our files.

Very truly yours,
CADILLAC GAGE COMPANY

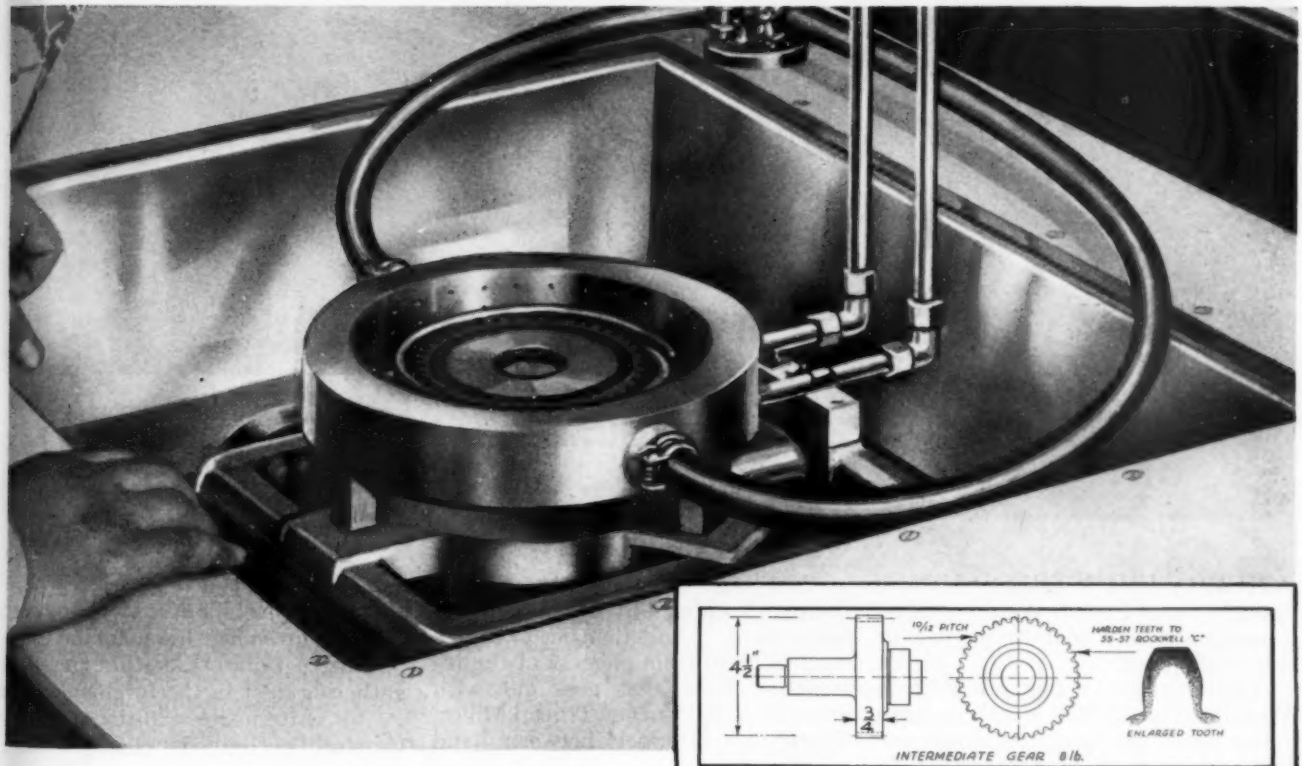
J. T. Bryant
Sales Manager

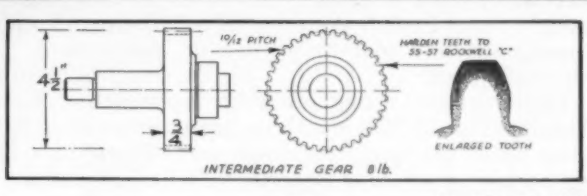
CADILLAC GAGES

VAN NORMAN INDUCT-O*

***(HIGH FREQUENCY INDUCTION HEATING)**

Hardens Teeth of 8 lb. Gear in 23 Seconds . . . Cuts Costs 43%





Comparison of costs of hardening gear teeth by carburizing SAE 1020 and by induction hardening SAE 1045.

COST AND OPERATION	SAE—1020 CARBURIZE	SAE—1045 INDUCTION
Cost of steel	.40	.43
Carburize @ .039 per lb.	.319	—
Cost of heat to harden	.041	.01
Cleaning	.02	—
Total cost	.78	.44
Saving		43%

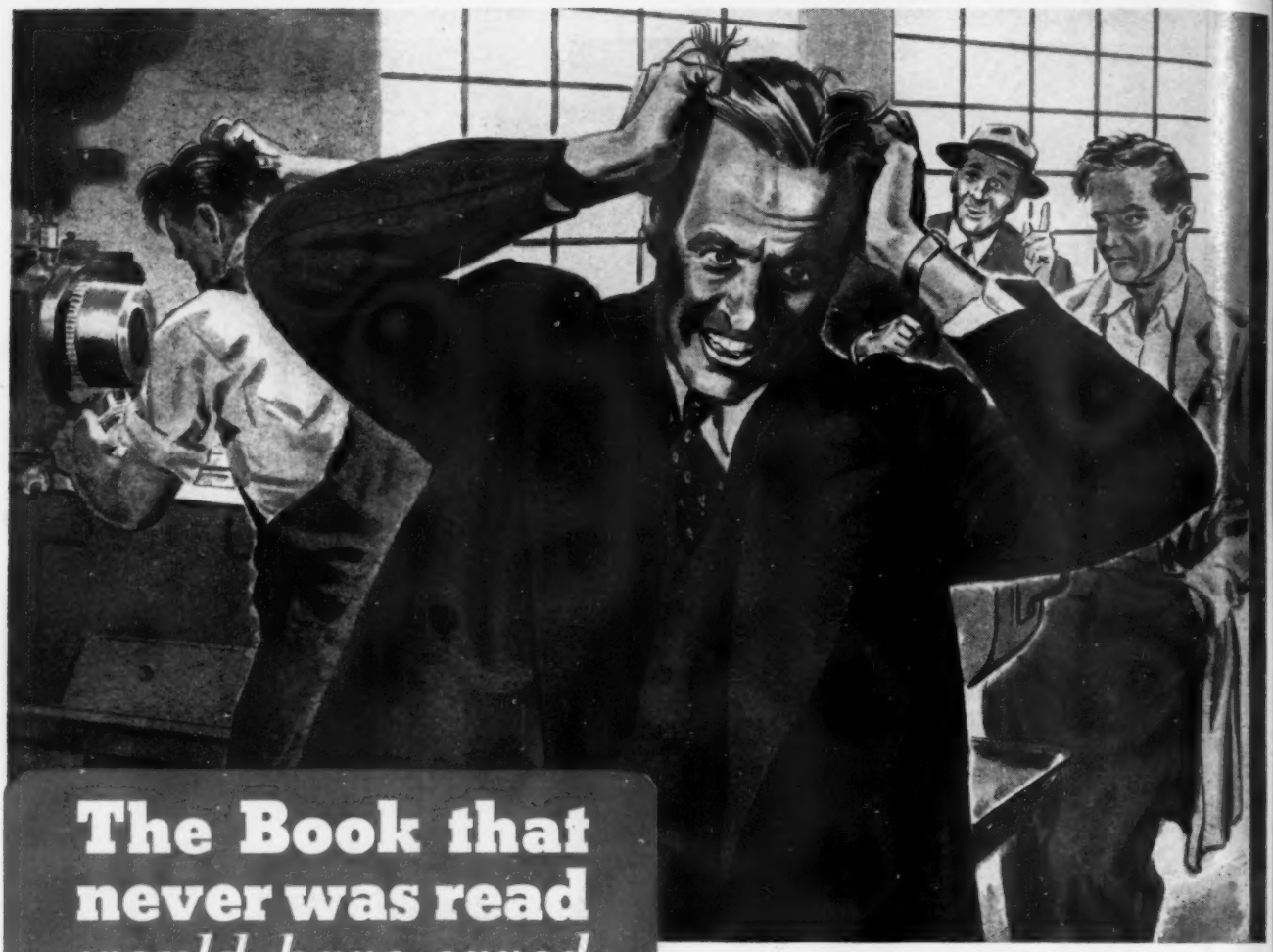
Typical of the many heating operations performed quickly and efficiently at lower cost on the Van Norman Induct-O is the surface hardening operation, illustrated.

The teeth of the 8 lb. gear are hardened to 55–57 Rockwell C in 23 seconds which includes 15 seconds for heating and 8 seconds for quenching. Depth of heat penetration is .035" to .045". There is no scale formed on any part of the gear thus cleaning operations are not necessary. In addition to speeding up the output of hardened gears, Van Normanizing conserves alloy steels and cuts costs by 43% through the elimination of carburization. A comparison of costs for the gear, shown, on which only the teeth are required hard is shown above.

Get the facts on Van Norman High Frequency Induction Heating for Surface Hardening, Brazing, Soldering, Annealing, Forging or Melting. Write for catalog, today.

VAN NORMAN MACHINE TOOL CO., Springfield, Mass.
ELECTRONICS DIVISION

"It pays to Van Normanize"



The Book that never was read *would have saved two days*

The superintendent was tearing his hair

A HURRY-UP DISTRESS SIGNAL brought one of Pratt & Whitney's able, versatile machine tool service men to a big war plant.

There he found a fine new Pratt & Whitney Thread Miller with its head taken apart, a repair man slowly going cuckoo, a machine operator idly standing by, and the superintendent tearing his hair over the production hold-up. "What's the trouble?" the P&W man asked.

"Rapid traverse mechanism is shot," they told him. "Spindle is frozen, the operator thinks."

"How was the machine used last?"

"Why it was running fine until we changed the set-up, and ran the table across with the hand crank. Then she went blooey." The P&W man smiled politely, growled words lost in the roar of the other machines, and set to work.

Re-assembled, the miller ran smooth as a top.

Open-mouthed, the operator and repair man stared. "What did you do?" they wanted to know.

"Nothing," the P&W man told them. "Nothing but disengaged the hand crank." And then he patiently read to them from page 12 of the instruction book that goes out with every Pratt & Whitney Thread Miller. There's an interlock between hand crank and power traverse lever. Power can't be turned on while the hand crank is engaged; we planned it that way to avoid trouble. We won't have a hand crank that will spin under power.

Moral: Machine Operators and Repairmen Should *Read* the Instruction Books . . absorb the "know-how" we have carefully written out

NOW — *it's not too late* — see to it that every machine operator and every repair man *knows* his machines. Dig up instruction books that may be gathering dust in the foreman's desk . . . or write us for additional copies. Carefully compiled, clearly stated details on your P&W machine are between those covers. The "know-how" on those printed pages can prevent the loss of production and the needless waste of our service men's priceless time. Will you help?

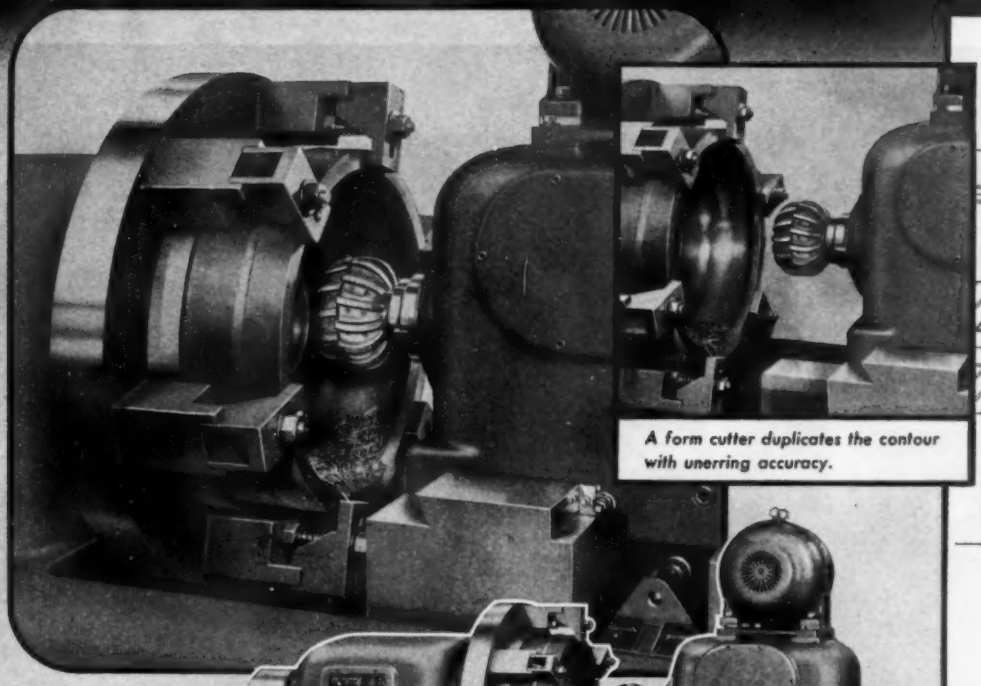
PRATT & WHITNEY
Division Niles-Bement-Pond Company
West Hartford, Connecticut

PRATT & WHITNEY

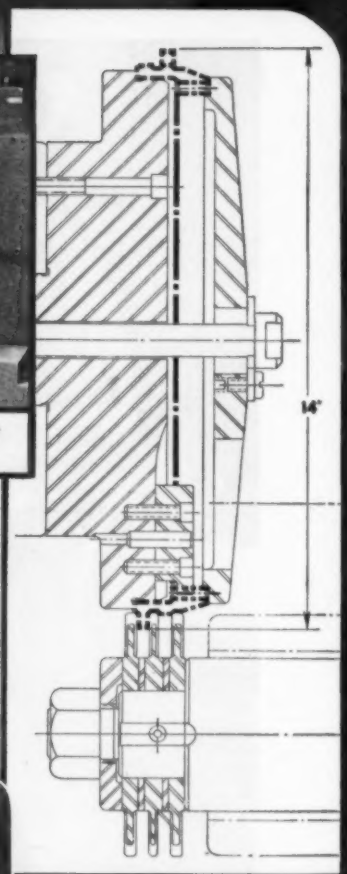
MACHINE TOOLS ★ SMALL TOOLS ★ GAGES

WEST HARTFORD CONNECTICUT

Basic Accuracy for Mass Production



A form cutter duplicates the contour with unerring accuracy.

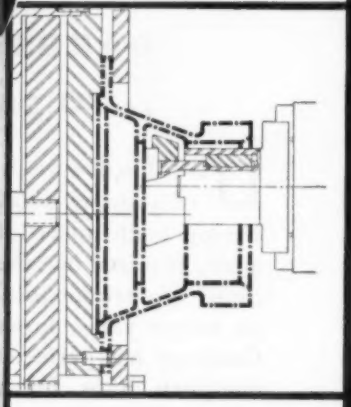


External operations with interrupted cuts are finished to close tolerances with the Cross Rotary Miller.

CROSS NO 13 *Rotary Milling Machine*

TOP ACCURACY—A GOOD FINISH—1/12 THE TIME is the story of machining Fluid Drive Housings with the Cross Rotary Miller. Automatic operating cycle with centralized push button control enables unskilled labor to achieve maximum results without scrap. Three models for small, medium and large work.

First and Foremost with Rotary Milling.



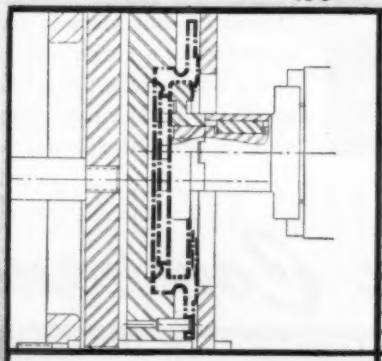
Irregular contours are processed in the usual way without special attachments or tooling.

CROSS GEAR & MACHINE CO.

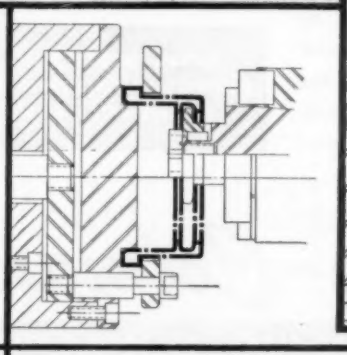
Established in 1898

DETROIT, MICHIGAN, U.S.A.

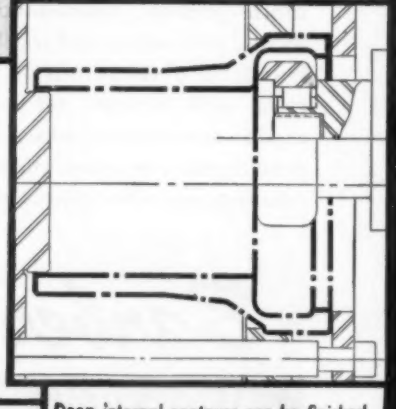
130



Rotary milling is an ideal method for handling many difficult operations on aircraft parts.



Multiple edge cutting tools with an enveloping cutting action satisfy the most exacting demands for fine finish.



Deep internal contours can be finished in one operation with the Cross Machine.

Hob Size ¾" x ½" x .315"

BARBER-COLMAN SMALL FINE-PITCH HOBS

...TO 200 D. P. GROUND...TO 250 D. P. UNGROUND

UNTIL a few years ago, the production of accurate small gears and pinions, having teeth spaced from .007" to 050" apart, required that the teeth be cut one at a time. No production tools were available. In recent years, however, Barber-Colman Company has perfected the manufacture of fine-pitch hobs for work of this class. Now the field of small gear manufacture is able to enjoy the advantages of rapid continuous hobbing production, accurate gear tooth profiles, reproduction of identical forms, and minimized tooth to tooth errors. Hundreds of thousands of tiny gears and pinions are now used in mechanisms where the gearing must be quiet, smooth running, interchangeable, and able to operate properly under all conditions. Many of these are in the intricate war machines that are so important to us today. When it is considered that the tooth forms and clearances required on hobs used for producing these parts are measured in terms of ten-thousandths of an inch, the ability of Barber-Colman tool craftsmen to maintain close limits of accuracy on these hobs is all the more significant. The complete story of this extraordinary development is told in our new book "Facts About Small Fine Pitch Hobs". If you do not already have a copy, write for one today and learn what these hobs can do and how to use them properly and to best advantage.

CUTTING TOOLS ARE SCARCE
MACHINES CAN'T RUN WITHOUT THEM
CONSERVE WHAT YOU HAVE

Buy War Bonds

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

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1887 *1943*

★ ★ ★ ★ ★ ★ LeBLOND CINCINNATI, OHIO U.S.A. ★ ★ ★ ★ ★ ★

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ENGINE LATHES
12 to 50″ Heavy Duty

TOOL ROOM
12 to 18″ Precision Lathes

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13 to 24″ Light Type Engine Lathes
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THE RAPID PRODUCTION LATHE
13 to 20″ Plain Turning, non-screw cutting models

OIL COUNTRY
27″-30″ Hollow Spindle Lathes

THE FULL AUTOMATIC
12 and 16″ Models

THE SEMI-AUTOMATIC
6, 9 and 12″ Multi-Cut Lathes

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Universal, Duplex, Semi-Automatic and Full Automatic Models

GUN BORING MACHINES
Models 1, 3, 4 and 6

GUN RIFLING MACHINES
Models 2, 3 and 4

SLIDING BED GAP LATHES
19″-38″ — 25″-50″ — 30″-60″ Models

THE CUTTER GRINDER
No. 2 Plain and Universal

"If It Turns — Consult Us"

THE R. K. LeBLOND MACHINE TOOL COMPANY

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CHICAGO: 20 N. Wacker Drive
Phone State 5561

NEW YORK: 103 Lafayette Street
Phone Canal 6-5281

no pits...

no burns...no errors!

Harmful overloads are doomed to defeat when electrical circuits are protected with Westinghouse "De-ion" Circuit Breakers.

Momentary overloads are passed without interruption; but before any disturbance can become dangerous, the sensitive Bi-metal element goes to work, *quick!* The circuit's broken, the arc quenched, in the blink of an eye.

Contact points are protected against severe pits and burns. The "De-ion" arc quencher draws the arc into the chamber, divides and smothers it in half a cycle. Contacts last longer; require less maintenance. And service is just as easily restored.

Once the condition causing the disturbance has been corrected, a simple flip of the indicating handle restores the circuit . . . in seconds. No waiting for a maintenance man; no parts to repair or replace.

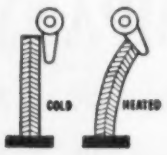
Protect equipment and circuits with Westinghouse "De-ion" Circuit Breakers. Ratings up to 600 amperes; enclosures for practically every type of service. Get in touch with your local Westinghouse representative today. Westinghouse Elec. & Mfg. Co., E. Pgh., Pa., Dept. 7-N.

J-21276

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

"DE-ION" CIRCUIT BREAKERS

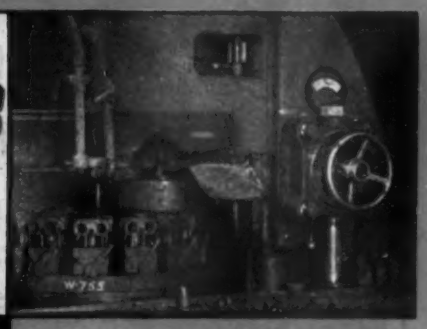


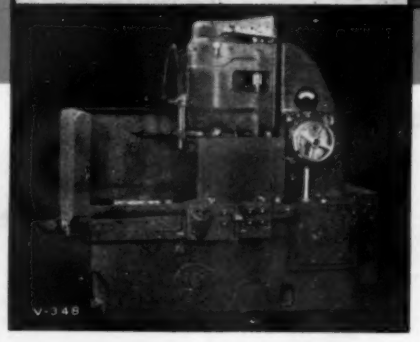
"IN THERE PITCHING" is this Westinghouse Bi-metal element. Two metals which react differently under heat are bonded together. Threatening overloads cause this Bi-metal to bend, tripping the interrupting mechanism, opening the circuit.

CATCHING THE "HOT ONES" is the job of this "De-ion" arc quencher. Made of parallel metal plates in the form of a grid, it draws the arc into the chamber, divides it into segments and smothers it between the plates... all in the space of half a cycle.

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING





Oil burner pump parts ground on the Blanchard No. 18 Surface Grinder.

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

THE BLANCHARD NO. 18 SURFACE GRINDER is used to rough and finish grind the oil burner pump parts shown above. They are first ground from the rough, then they are normalized and ground again. All boring and drilling operations are located from the flat Blanchard ground surfaces. After machining, all parts are finish ground on the Blanchard. Twelve pump bodies are ground at once on fixtures mounted on one base plate. The base plate is held magnetically, therefore the chuck may be cleared quickly for a change of jobs. The cast iron pump bodies are 6 inches in diameter. .012″ of stock is ground off one side to limits of +.0003″ —.0001″ at a rate of 48 pieces per hour.

★ . . . . . *Especially valuable on jobs like the one illustrated.*

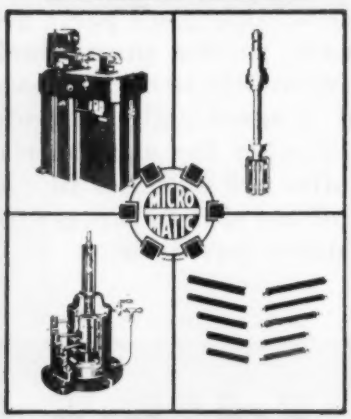
The **BLANCHARD**
MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

Honing *shared in converting yesterday's "PRIDE OF THE FLEET" into the* MODERN ECONOMICAL TRUCK CARRIER

HONING MACHINES HONING TOOLS



HONING FIXTURES ABRASIVE STICKS

Yesterday—*Called "slave ships" and "kidney busters" by drivers, yesterday's trucks were hard to drive, costly to operate, and required almost constant service. But with all their crudities, they inaugurated a new era in highway transportation and distribution of goods. Grinding—an early process of controlled abrading—made them possible.*

Today—The powerful modern carrier has higher speed, maximum economy, long periods between overhauls, easy maintenance, a high pay-load factor—the goal of yesterday's builders. HONING, the modern, controlled abrading process, helped engineering design and production achieve this mechanical triumph.

Tomorrow—Today's tough military service and maintenance will be projected rapidly into commercial and industrial use. The competitive movement of bulk-weight shipments will require greater and greater operating efficiency.

In the mechanical refinements to come, HONE ABRADING processes developed by Micromatic will be ready to play a most important part.

MICROMATIC

HONE CORPORATION

Detroit, Michigan

MAKERS OF HONING MACHINE TOOLS

Army Transport Now Races
On Honed Working Surfaces

Only yesterday army trucks crawled briefly between breakdowns—because of poor bearing surfaces. Modern carriers—trucks, tankers and prime movers have to be tough to stand the continuous service under heavy going.

They now race dependably on accurately honed working surfaces. Speed and time between overhaul have been multiplied. They are better because of their precision bearing surfaces. Honing assures this surface quality, and eliminates loose bearings, inaccurate fits, fatigue cracks, and other enemies of durability.

Microhoning—the modern abrading process—removes stock at rates up to 65 cubic inches per hour—generates accuracy for roundness and straightness of bore within .0002″ to .0003″ and any desired surface finish.

Trucks — planes — tanks — jeeps — ordnance — ships — Microhoning has many applications in war . . . and many more in peacetime use. Write for Bulletin A. R. 67.

Some Microhoned Heavy Vehicle Bores

Gas and Diesel Engine Cylinder Bores and Sleeves

Connecting Rod Bores (Large End)

Valve Guide Bores

Diesel Fuel Injector Bores

Shock Absorber Bores

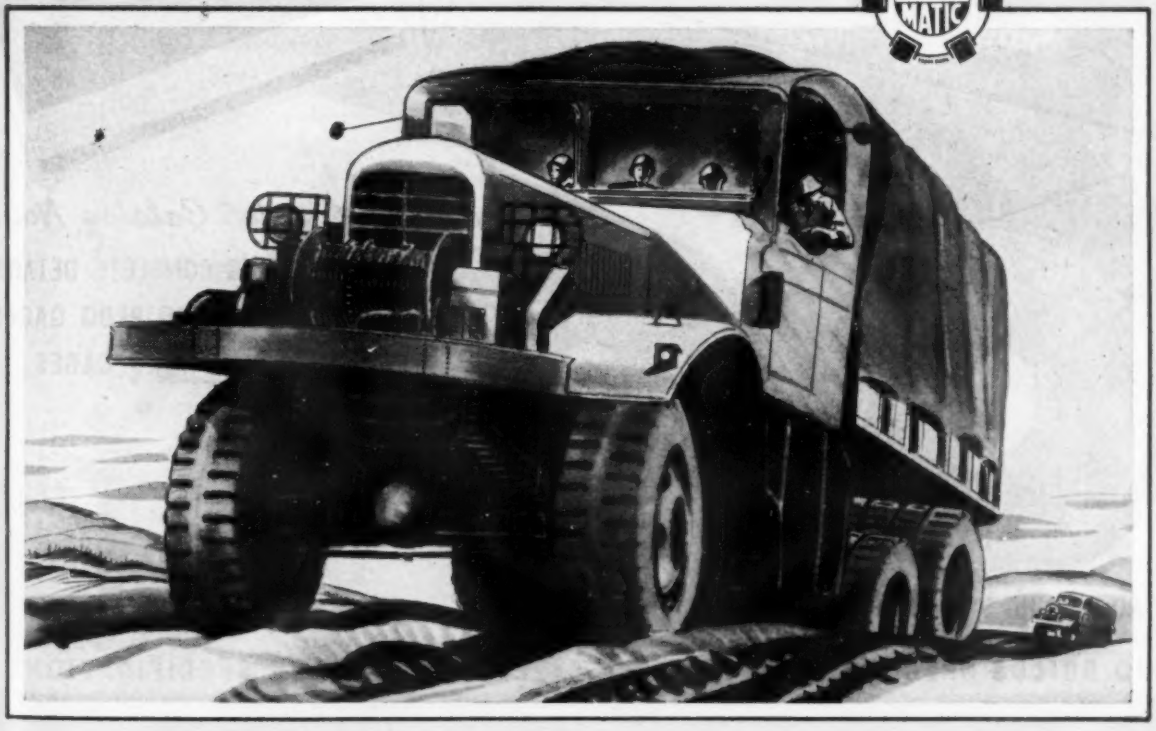
Brake Cylinder Bores

Transmission Gear Bores

Ditching Machine Planet Gear Bores

Roller Tooth Steering Sectors and many other parts.

MICRO MATIC



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ULY

THERE IS A SILVER LINING

In each convoy—a few Liberty Ships. In some—Many. And hundreds more to come.

What seem to be rays of hope now, will eventually floodlight a blazing victory.

In the convoy-studded seas, many units of the Allied armadas are powered with steam and diesel engines from the famous Hamilton engine shops of General Machinery. There is nearly a century of know-how in General's machinery making.

GENERAL MACHINERY CORPORATION

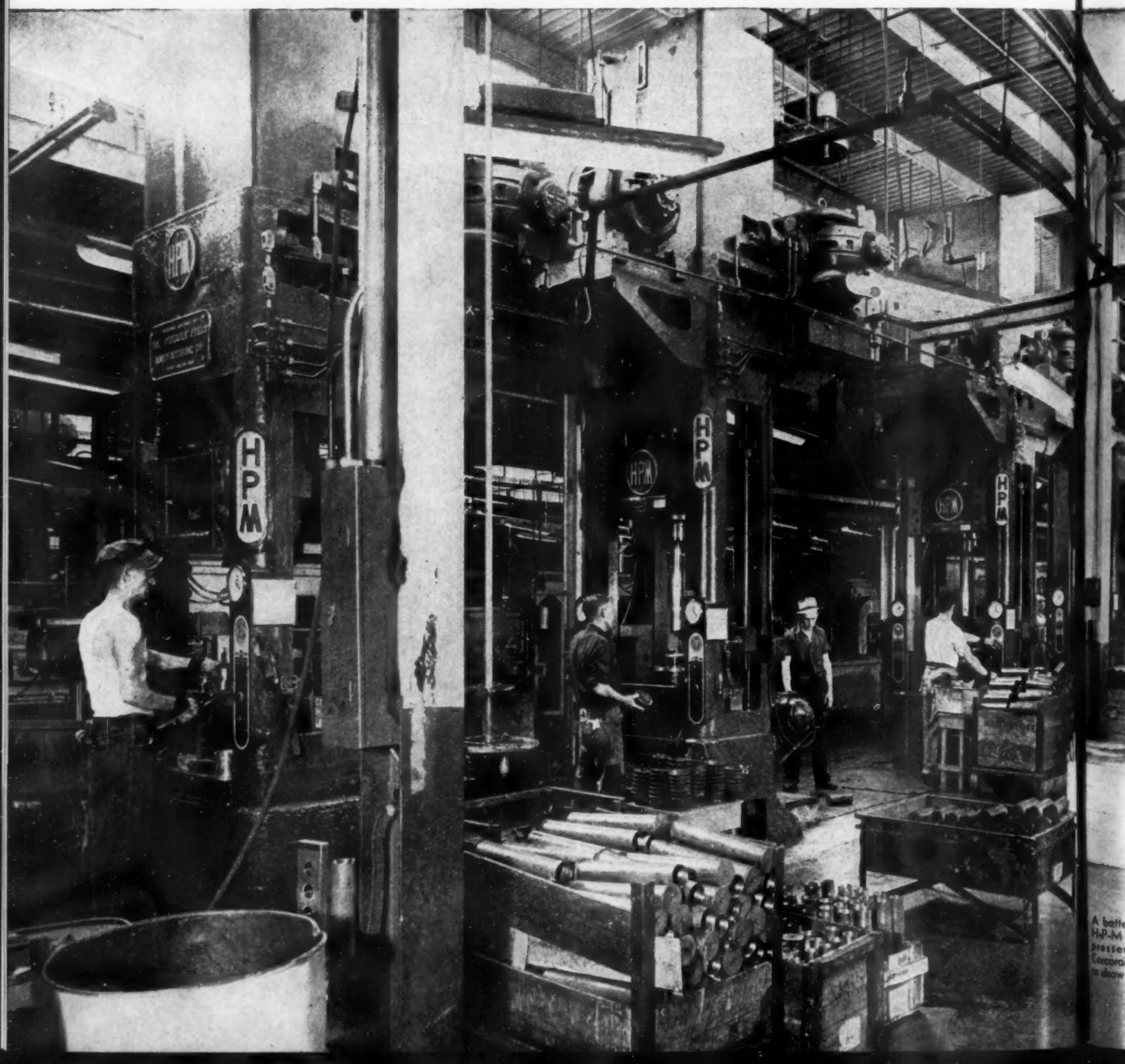
HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

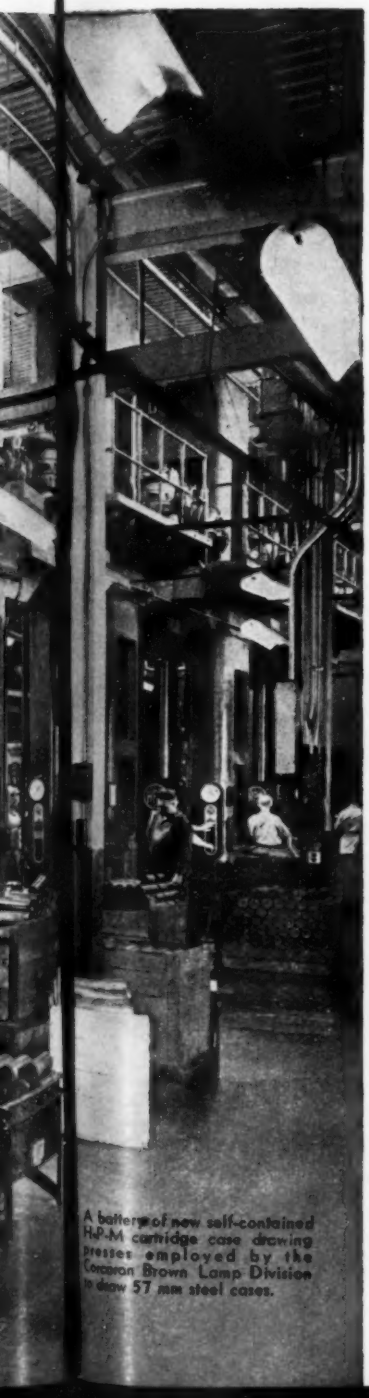
GENERAL MACHINERY ORDNANCE CORPORATION

Cartridge Cases of STEEL
A Production Achievement
made possible with
HPM FASTRAVERSE PRESSES



Above is illustrated the progressive stages required to manufacture 57 mm steel cartridge cases.

Above—A close-up view of an H-P-M cartridge case press performing the final draw on a 57 mm steel case.



A battery of new self-contained H-P-M cartridge case drawing presses employed by the Corcoran Brown Lamp Division to draw 57 mm steel cases.

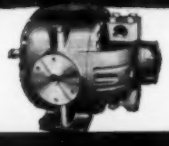
America's supply of vital copper and zinc has been greatly conserved by the remarkable conversion of artillery cartridge cases from brass to steel. • The Corcoran Brown Lamp Division of Electric Auto-Lite Company pioneered this revolutionary conversion. Peacetime experience with H-P-M FASTRAVERSE metal drawing presses made H-P-M presses the preferred type for their new steel cartridge case shop. • H-P-M cartridge case presses are breaking all records in the production of ordnance material. • Regardless of whether you are making ships, tanks, guns, shells or aircraft . . . choose H-P-M FASTRAVERSE metal working presses for your production requirements. Write today, for complete specifications.

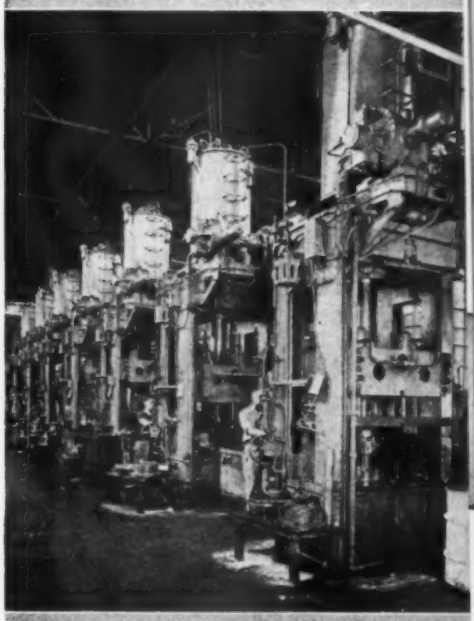
THE HYDRAULIC PRESS MFG. CO.

Mount Gilead, Ohio, U. S. A.

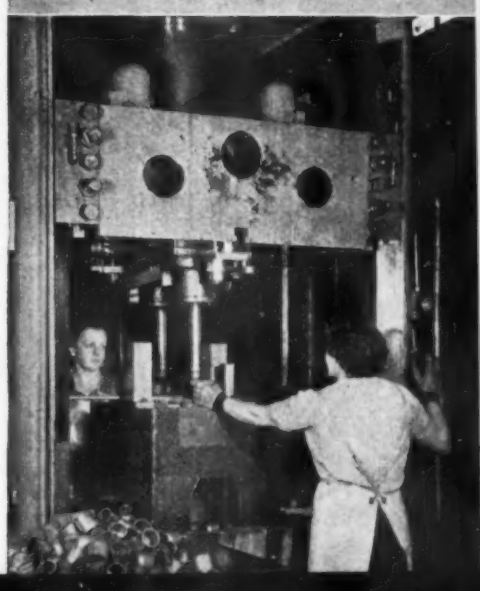
District Sales Offices: New York, Syracuse, Detroit and Chicago
Representatives in Principal Cities

The dependable long life H-P-M HYDRO-POWER Radial Pump Powers every H-P-M Hydraulic Press



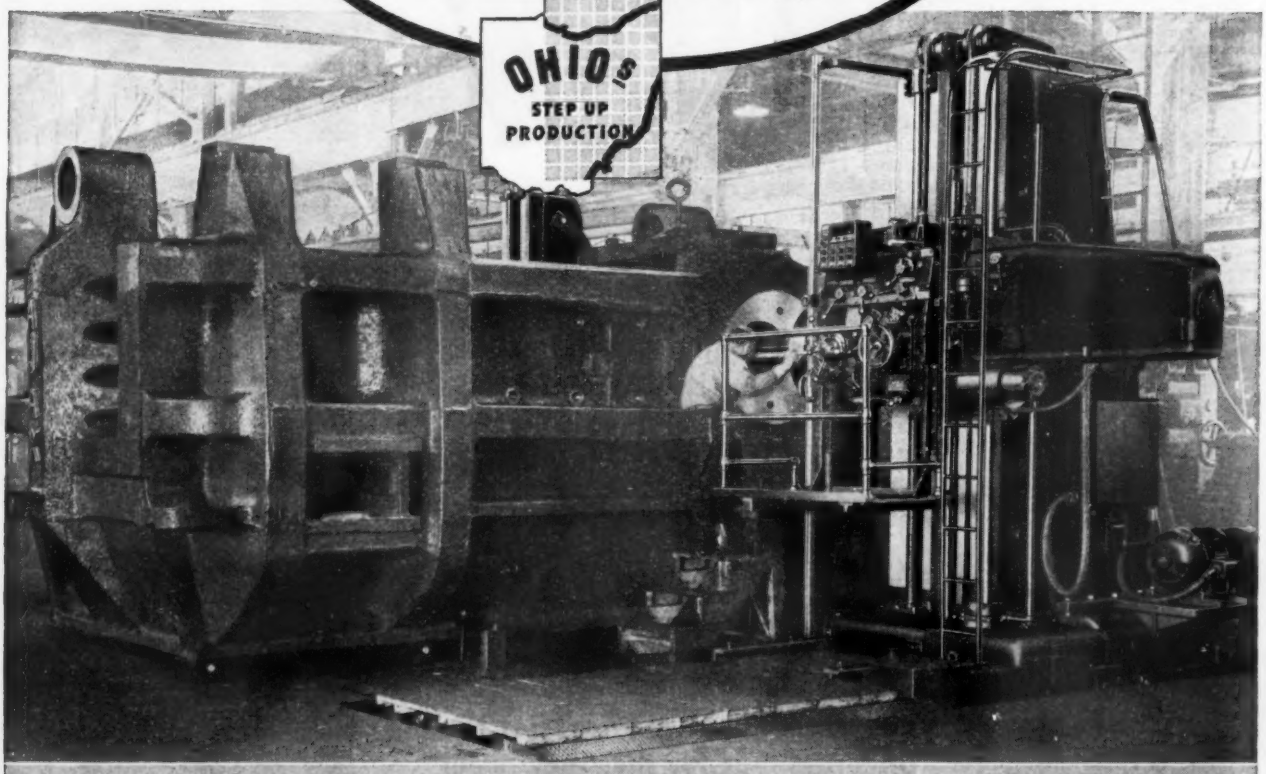


A battery of H-P-M self-contained deep drawing presses used to draw 37 mm steel cases. These presses were installed in 1936 for drawing automobile headlamps. Their conversion to cartridge case production proves their versatility. Below is illustrated the dual punch die set-up for all drawing operations on the 37 mm case.



OHIO HORIZONTAL

BORING, DRILLING AND MILLING MACHINES



Ohio Horizontal extra heavy duty Boring, Drilling and Milling Machine (floor type) bores steel bed frame of 8" Ajax Forging Machine for crankshaft bearing sleeves. Work done fast, accurately, profitably.— Photograph by courtesy of The Ajax Manufacturing Company, Cleveland, Ohio.

When America's first all-anti-friction boring, drilling and milling machine appeared it bore the name of Ohio. Ever since, we have endeavored steadily to add new features worthy of this precedent. Example: *a portable control feature which enables the operator to get more work done in less time with less effort.* Other features: nitrided spindle, narrow guides, internal gear-tooth type clutches, unit construction, anti-friction bearings, built-in rapid traverse to spindle and all other parts, continuous spindle feed of 72" with full-length spindle support, push-button control. Floor and table types in both heavy duty and extra heavy duty models . . . Ask for a copy of our well illustrated Bulletin 300.

THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO

Orders for Ohio Horizontals are being shipped with reasonable promptness.

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

Prompt Delivery? **Yes!**
But with Strict Adherence to Accuracy on "STANDARD" Seasoned

PLUG GAGES

PROMPT DELIVERY

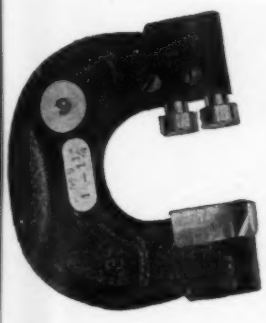
THE ACCURACY and economy of "STANDARD" Plug Gages is a byword and a "buy word" wherever precision parts are made. Even in today's constant clamor for *SPEED*, the material, craftsmanship and accuracy of "STANDARD" Gages are faithfully maintained.

Conserve Vital Gage Steel . . . Increase the Life of PLUG GAGES with Hard Chrome Plating

Salvage worn Plug and Ring Gages, save vital gage steel and conserve man and machine time with Hard Chrome Plating by STANDARD. Applied to new Gages as well as to Gages worn below original size, their life is increased 3 to 5 times.

STANDARD

Snap Gages



SNAP GAGES designed for ease in handling and speed in inspection. "STANDARD" Snap Gages are *standard* equipment for fast, precise war production. Constant analysis of materials and precision inspection at every stage of their manufacture insure the quality, stamina and accuracy of these *standard* "STANDARD" products.

SUPER *Snap Gages*

AN IMPROVED Snap Gage with spherical gaging pins that eliminate out - of - parallelism. Easily set, it requires no simultaneous adjustment to a given dimension and to parallelism. SUPER Snap Gage simplifies inspection, speeds production, insures greater accuracy and facilitates setting to closer tolerances. Write for special bulletin.

Complete Stocks Ready for Immediate Shipment

STANDARD GAGE CO., INC., *Poughkeepsie, N. Y.*

The Operator may be different but the Quality of Tool Grinding is the Same

THE essential features of the Sellers Heavy Duty Tool Grinding Machine—simplicity, accuracy, uniformity—are of greater value today than ever before. They permit the operation of these versatile, high production precision tool grinders by newly trained and relatively inexperienced personnel. Even women operators on these machines can grind any cemented carbide or high speed steel, straight or convex curved face tools, including thread tools of any angle of thread or pitch, internal or external, and can accurately reproduce the desired angles or clearances on all the tools. They keep production moving.

WILLIAM SELLERS & CO., INC., PHILADELPHIA, PA.

FOUNDED SELLERS 1848

Sellers

Performance
TODAY
that forecasts Precision Threading Standards of
TOMORROW

LEES-BRADNER
Light Type THREAD MILLER

● Today hundreds of Lees-Bradner LT Thread Millers are turning out precision threads on a wide range of work for airplanes—tanks—and other vital war equipment at an unusually high production rate.

The exacting tolerances and high production demanded on threads for armament forecast to no small degree the standards expected on post-war precision threading—then as now they will be met with Lees-Bradner Thread Millers.

Why not investigate the advantages of L. B. Thread Millers for your precision threading work?

The LEES-BRADNER *Company*
CLEVELAND, OHIO, U.S.A.

Your Workers, Your Company, Your Country

All Lose—*with "Lost-Time Eyes"*

. . . protect workers' eyes with AO Goggles

What does a worker think about while lying in a hospital bed or at home, suffering from an injured eye? He thinks of his own pain . . . the worry of his family . . . his lost time. He builds up a resentment against his company for not providing him with the proper eye protection.

But an eye-injured worker is not the *only* loser. Companies that *allow* "lost-time eyes" to happen also lose heavily in hard-earned dollars, irreplaceable workers, invaluable production. And as a result, our Country . . . for which we are all fighting . . . loses heavily, too, in vital war equipment.

Give your men and women workers AO Goggles to give our fighting forces *what they must have for Victory*. AO Goggles are strong and sturdy . . . yet they are also light and comfortable. Equipped with Super Armorplate Lenses, they provide maximum protection against impact. Have your Safety Director get in touch with the nearest American Optical office.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

MANUFACTURERS FOR 110 YEARS OF PRODUCTS TO AID AND PROTECT VISION. BRANCHES IN ALL PRINCIPAL INDUSTRIAL CENTERS

A Letter from Guadalcanal...

In a recent letter from a lad at Guadalcanal to his former employer was voiced the greatest challenge of our time.

"What," he said, "am I, and all these fellows with me, going to do when this thing is over?" Is peace to bring with it the deadly spiral: men laid off and demobilized, hence less purchasing power, hence more plants closed down, hence more men laid off, hence — ?

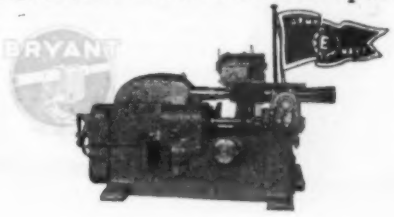
We believe we've seen the answer right on the production lines and right in the post-war plans of American industry.

We've seen and consulted with hundreds of research men uncovering new secrets in metallurgy, synthetics, plastics, aeronautics — finding new techniques and economies — planning new and wonderful products that will cushion the post-war interim to the greatest production age in history.

As internal grinding specialists, we at Bryant have already helped to solve production problems involving the machining of many new light metals, alloys, and synthetic materials including glass, plastics, hard rubber, wood, graphite, and even machine parts made of paper.

We've developed many new techniques in tooling, and we believe that this knowledge is important to your future. For that reason, our Consulting Service is available at all times. Call upon us now!

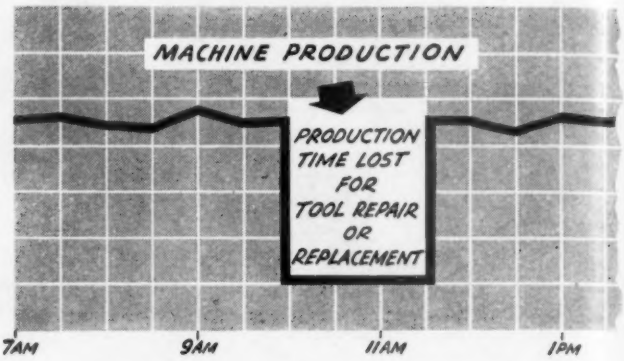
SEND FOR THE MAN FROM BRYANT...

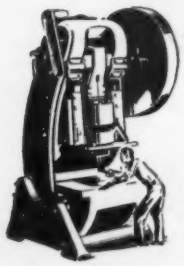


Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.

How to reduce PRODUCTION INTERRUPTIONS caused by tools





Certainly one of the biggest problems of round-the-clock production is finding ways to prevent loss of production time caused by frequent shut-downs to redress or replace tools that wear too rapidly or fail too soon. If *you* could get several hours, or even ten minutes, extra production time per day from each machine in your plant, wouldn't it make *your* production schedules easier to meet?

Here is a Method for Solving the Problem

Many busy war plants have found the answer to the problem of getting more production per machine by using the Carpenter Matched Set Method of tool steel selection. Because it provides a definite *system* for selecting the one steel that is best for each tool, this method helps to get tools that give longer uninterrupted production.

Thousands of successful applications have proved that the Matched Set Method definitely helps to get more productive time from machines and tools. On the opposite page are four actual production line examples of how the Carpenter Matched Set Method has helped others get increased output from present equipment.

If you are anxious to get better tool performance in *your* plant—longer *uninterrupted* production runs—the Carpenter Matched Set Method can help you. The two books below can help you put this method to work in your plant.

For "Refreshing" Skilled Tool Makers and Training New Men. More than 35,500 copies of this text book are now in use. Copies are available to tool steel users in the U.S.A. *at cost,* $1.00—$3.50 elsewhere.

For Tool Room Foremen and Tool Hardening. A 167-page manual with a comprehensive explanation of the Matched Set Method of Tool Steel Selection, detailed heat treating data and hardening instructions. *Free* to tool steel users in the U. S. A.

HOW OTHERS HAVE STEPPED UP PRODUCTION PER MACHINE

A DIFFERENT KIND OF PUNCH

Fig. 1

JOB: A "shaving" punch for "staking" the lug indicated by the arrow in Fig. 1. This small punch cuts only on one side—the job is done in one blow—and the material is mild steel.

PROBLEM: As any tool maker will appreciate, the trouble was punch breakage. A *good* punch lasted only a few hours and the rest didn't last long enough to pay for setting them up.

SOLUTION: The Carpenter Matched Set Method indicated that a *tough* steel was needed—so the tool maker picked the toughest of the lot, SOLAR (Water-Tough).

RESULT: To the amazement of everybody, the first Solar punch put in the press ran for a week! The job was licked—and stayed licked.

WANTED— HIGHER PRODUCTION

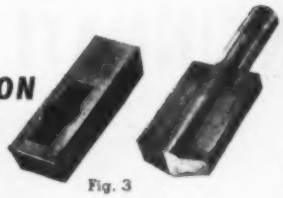


Fig. 3

JOB: Punching 3/16" thick O.H. steel sheets—19 punches and dies (Fig. 3) to the set-up. As this was a very *tough* job, the steel first tried was Carpenter's R.D.S. (Oil-Tough), toughest of the Oil-Hardening Matched Set. This gave 190,000 holes between grinds.

PROBLEM: To step up production per grind—so as to cut down shut-down time required for regrinding.

SOLUTION: Reference to the Matched Set Method indicated that greater wearing qualities could be obtained by moving north from R.D.S. to STENTOR (Oil-Hard).

RESULT: Punches and dies made from Stentor stepped up production *over 100%*—to 387,000 holes per grind. And here is an important point—while Stentor was chosen for its greater *hardness,* it also proved to have sufficient *toughness* to handle the job.

FOLLOWING THE ARROWS TO GREATER PRODUCTION

Fig. 2

JOB: A combination punch and die that works on cold rolled strip steel (Fig. 2).

PROBLEM: This tool had been made of high carbon tool steel—but it seemed impossible to get away from galling and scratching the work. Efforts to make the die "glass hard" only served to make the tool so brittle that the thin wall would break. The best production had been 600 pieces.

SOLUTION: The tool maker turned to the Matched Set Diagram, put his finger on the middle diamond and said, "Here is about where I am—and I want greater wear resistance." The arrow pointed north to K-W (Water-Wear), so the next tool was made from that steel.

RESULT: Production increased to *12,000 pieces!*

TWO JUMPS TO FIND THE ANSWER

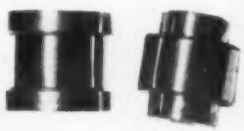


Fig. 4

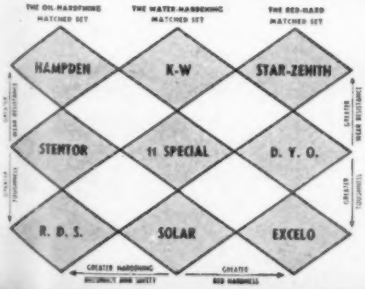
JOB: Making 3" diameter rolls used for rolling a bead on stainless strip .008" thick. Note the thin edge on the bead.

PROBLEM: When made of carbon tool steel, the thin bead cracked in hardening, so the Matched Set Method was followed to STENTOR (Oil-Hard) for "greater hardening safety." When made of Stentor, the bead stayed on in hardening safe enough, but when placed in service the strain was too much for the thin section in this hard steel, and the edges chipped.

SOLUTION: Referring again to the Matched Set Method indicated that moving south to R.D.S. (Oil-Tough) would provide greater *toughness.*

RESULT: Made of R.D.S., the rolls shown in Fig. 4 had turned out "miles" of molding when this picture was taken—and the bead is still there!

Important before—VITAL NOW!



The actual job examples outlined above show how others have used the Carpenter Matched Set Method to reduce production interruptions and increase output. Your Carpenter representative will be glad to show you how it can be applied to your particular requirements.

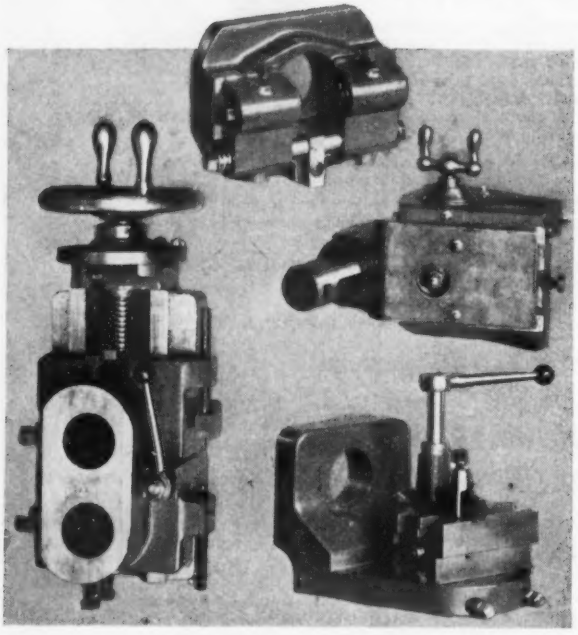
THE CARPENTER STEEL COMPANY
109 BERN ST., READING, PA.

Carpenter MATCHED TOOL STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

It takes the correct tools to do the job right

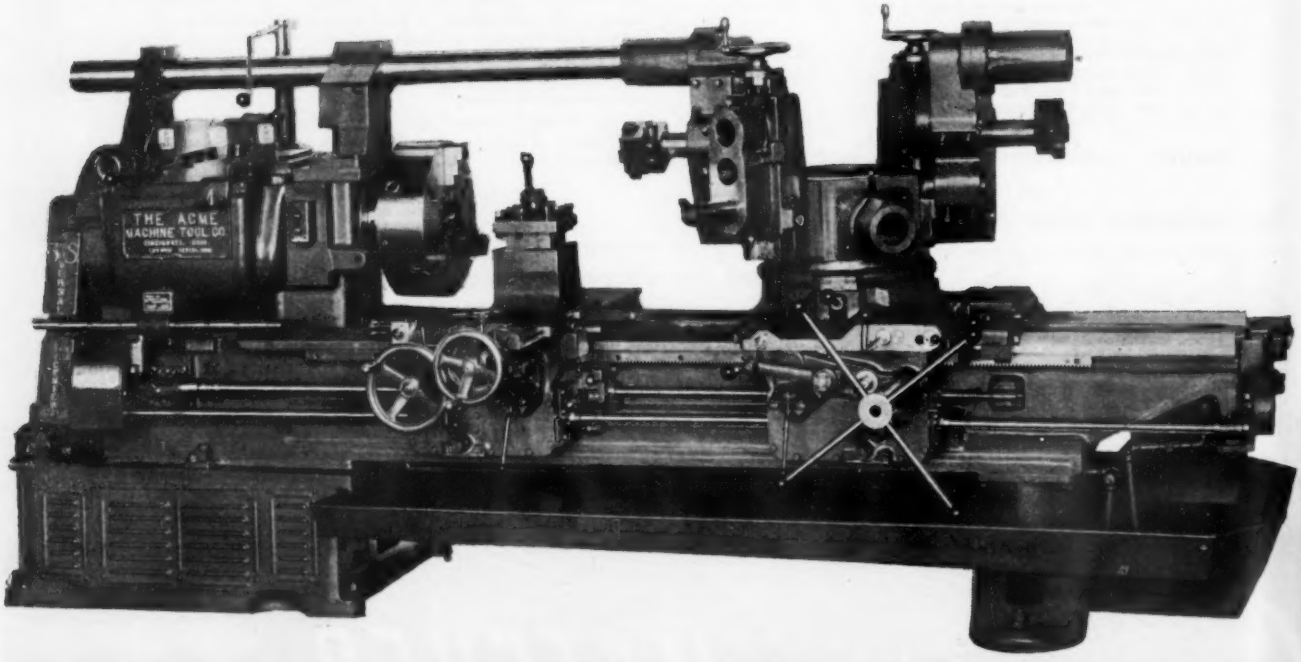
CINCINNATI ACME TURRET LATHES



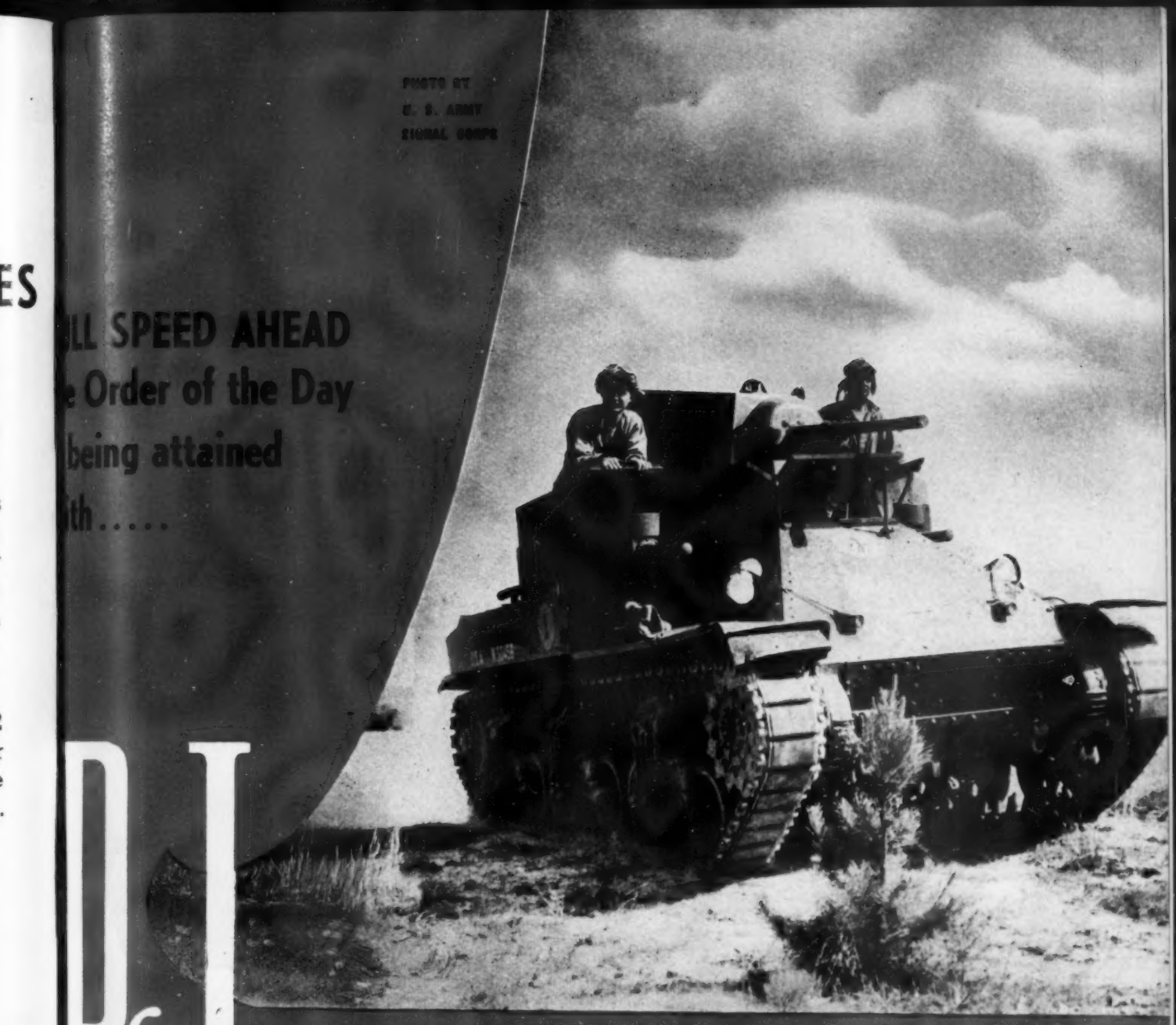
• This group of heavy duty tools and holders give Acme Turret Lathes a greater working range—provide closer tolerances and increase production.

The rigidity and massive design assures ample support to tools and freedom from vibration and chatter on heavy cuts. All tools and holders shown are adapted for use on the No. 3S Universal Acme Turret Lathe illustrated.

These tools are as follows . . . No. 1 Knurling Tool 3½ capacity . . . No. 2 Vertical Slide Tool . . . No. 3 Angular Chasing Tool Holder for Side Carriage . . . No. 4 Adjustable Angle Rack Tool.



The ACME MACHINE TOOL CO.
... CINCINNATI, OHIO.



LL SPEED AHEAD
e Order of the Day
being attained
th.....

P&J

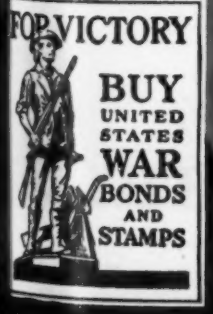
Automatic CHUCKING EQUIPMENT

Wherever the call has come for production and still more production in the great metal working Arsenals of Democracy, the answer has been universally the same—more parts in less time have come rolling off production lines.

P&J efforts to attain higher productivity than ever before have been two-fold—first in building a vastly increased number of Automatic Chucking Machines and second in developing tooling for the users of these machines to achieve remarkable results in output per machine. Time schedules, seemingly impossible to attain, are being met with outstanding success.

Not content with even these attainments, P&J engineers are constantly bettering performance by leaving no stone unturned in tooling which has any possible chance of clipping seconds from the time of machining operation.

The POTTER & JOHNSTON MACHINE CO., Pawtucket, R. I.



When Uncle Sam needs more tanks—give them to him . . . with **MORE WAR BONDS**

Cave-of-the-Winds in Miami

Inside this unique building, the engines of Pan American Clippers are put through their paces. Propellers roar with the thunder of 4000 horsepower —creating super-hurricanes as air is pulled down one set of stacks and pushed out through the other set.

Outside, there's hardly a sound—for in each stack a honeycombed unit of cells soaks up the resonance, bit by bit, until it is finally dissipated.

Naturally, this completely windowless test house had to be air conditioned—to remove heat generated by the engines, to provide controlled testing temperatures, to make working conditions bearable for the engineers. As in so many other exacting applications of air conditioning and industrial refrigeration, the equipment selected was General Electric.

Today, G-E air conditioning and refrigeration engineers are devoting all their talents to problems of war production and testing. They are learning much that will lead to better, more economical manufacturing methods—to healthier, happier living—when we return to the pursuits of peace.

Air Conditioning and Commercial Refrigeration Division, Section 437, General Electric Company, Bloomfield, New Jersey.

Air Conditioning by

GENERAL ELECTRIC

One of the important reasons the United Nations will win this war of the Air:

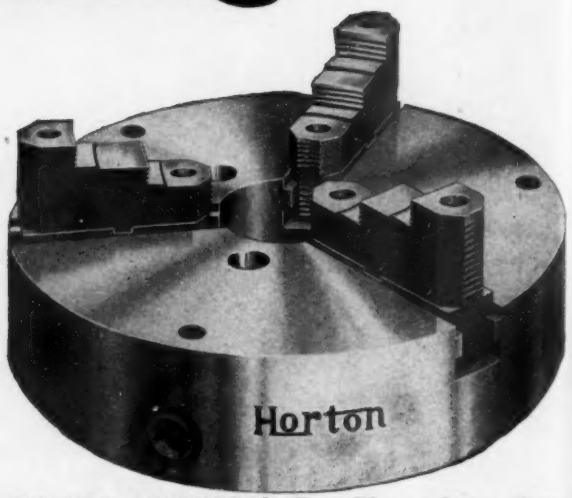
The hundreds of V.T.L.s now working in our major aircraft plants. Every Vertical Turret Lathe, with its two cutting heads, doubles production of the precision parts that fighters and bombers must have.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

Horton chucks

INDEPENDENT Solid Reversible Jaws Only

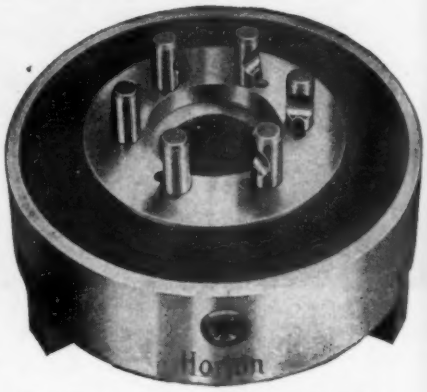


SCROLL UNIVERSAL Two-Piece Jaws Only

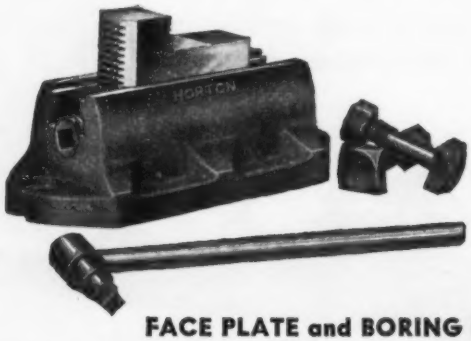
For Use With Intermediate Plates On Threaded Spindles

For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks



For Flanged Tapered Nose Spindles
Illustration shows Chuck for Type D (Cam Lock) Spindle

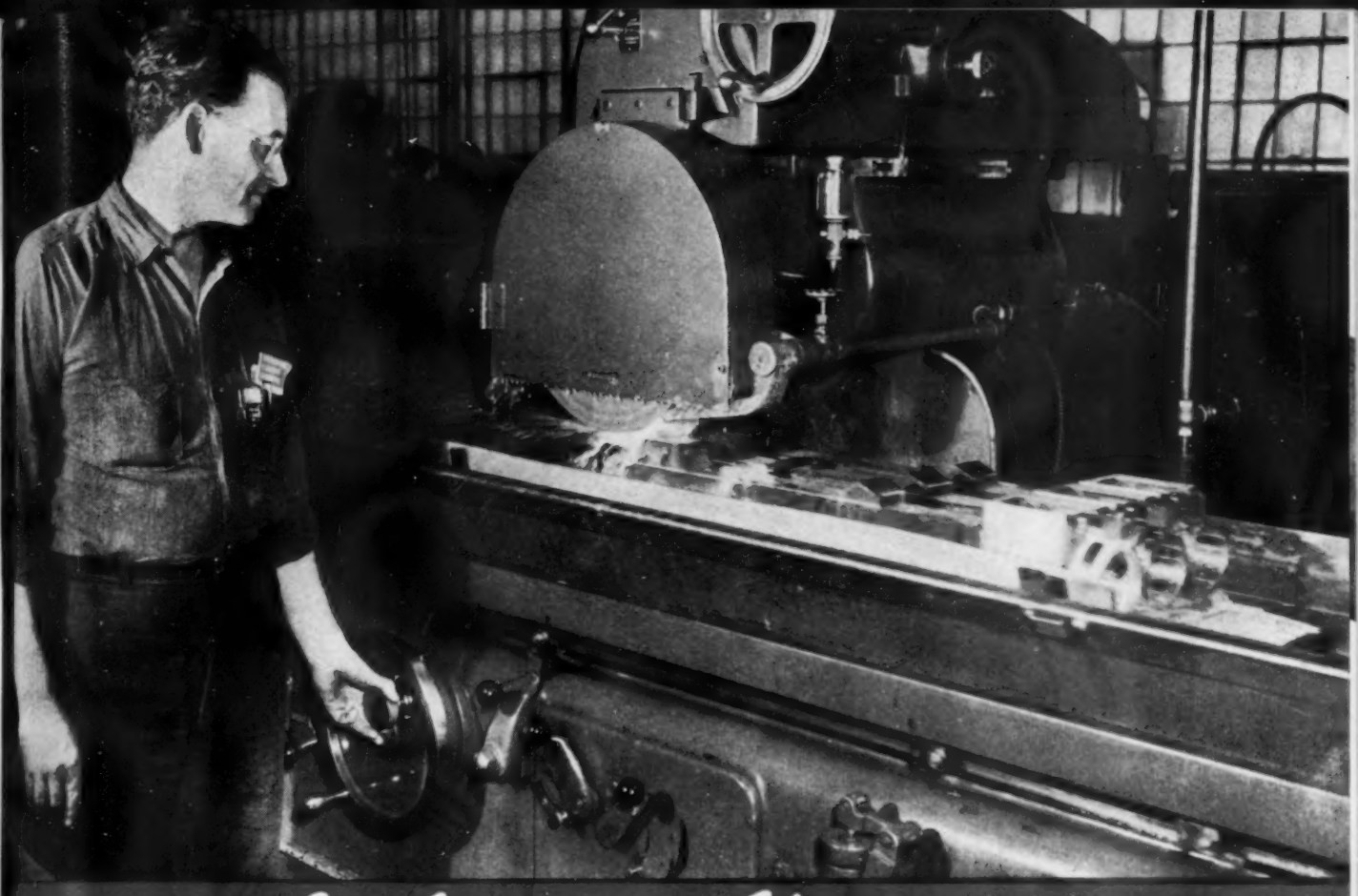


FACE PLATE and BORING MILL JAWS—Steel Body Only

HORTON MORROW

SINCE 1851 .... THE E. HORTON & SON CO.

WINDSOR LOCKS, CONNECTICUT, U. S. A.



An Intimate View of a THOMPSON GRINDER at work

• Today when precision work means production to tolerances of .0001 thousandth of an inch, Thompson Surface Grinders are helping hundreds of manufacturers to maintain rigid limits of accuracy and obtain remarkably s m o o t h finishes.

The hydraulic drive to grinding wheel, the motor mounted directly to the spindle, the hydraulic table drive, are factors in Thompson design and construction that provide greater power—freedom from vibration—and extreme accuracy.

Illustrated is a Thompson Type C Surface Grinder working 7 days a week on round the clock shifts to meet the demands of War production in one of America's converted automobile plants. Today this Thompson Grinder is producing its share of war materials — accurately — at high speed. Tomorrow it will be available for conversion to production of consumer goods—providing the smooth finish and tolerances that are bound to be demanded of post-war operation.

Consult Thompson on your Grinder Work.

Thompson Grinders are built in a wide range of types and sizes. The largest Type C—36" x 36" x 240".

THE Thompson GRINDER CO.

SPRINGFIELD, OHIO

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FINE PRECISION JOB FOR WHICH THEY ARE NOTED • • •
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MADE IN U.S.A.

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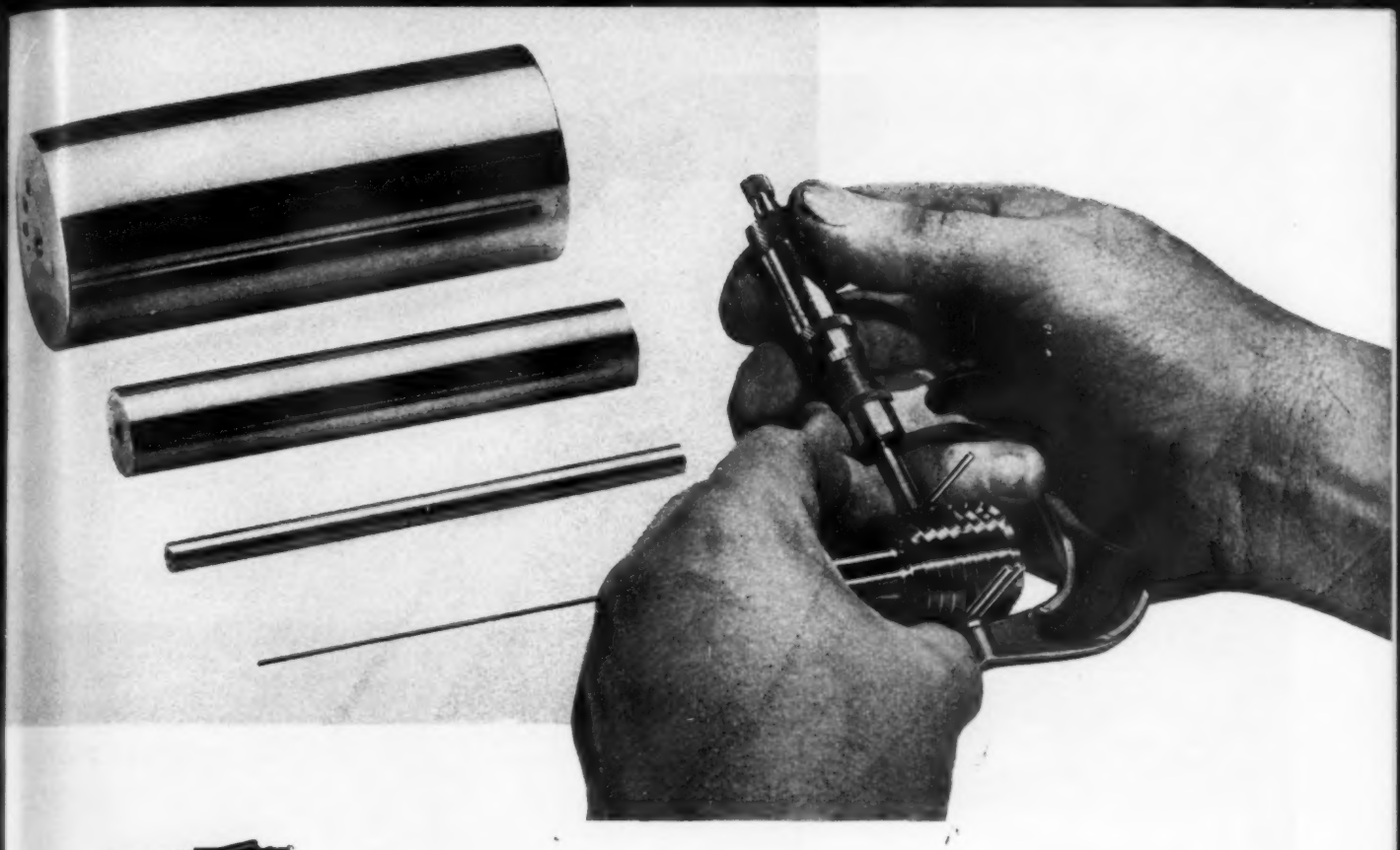

VK

THREAD MEASURING WIRES
A *Standard* FOR ACCURACY IN LEADING WAR PRODUCTION PLANTS

The wire system of thread and gear measurement is easy to use and gives exceptionally accurate results. Our Manual of precision measuring tools gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable handbook!

Leading arsenals and war production plants know the importance of accuracy in thread and gear measuring. That is why so many of these plants are using Van Keuren Measuring Wires as standard equipment for measuring thread gages, taps, worms, splines and spur gears. Made in any size from 1.5708" down to .002" in diameter, they are guaranteed to be within .00002" for roundness and straightness and within plus or minus .000025" for size. Special sizes can be made to your specifications as to size and tolerances. Easy to use, VK Wires bring ultimate accuracy to your operations. Write for full details.

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24th YEAR

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Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages
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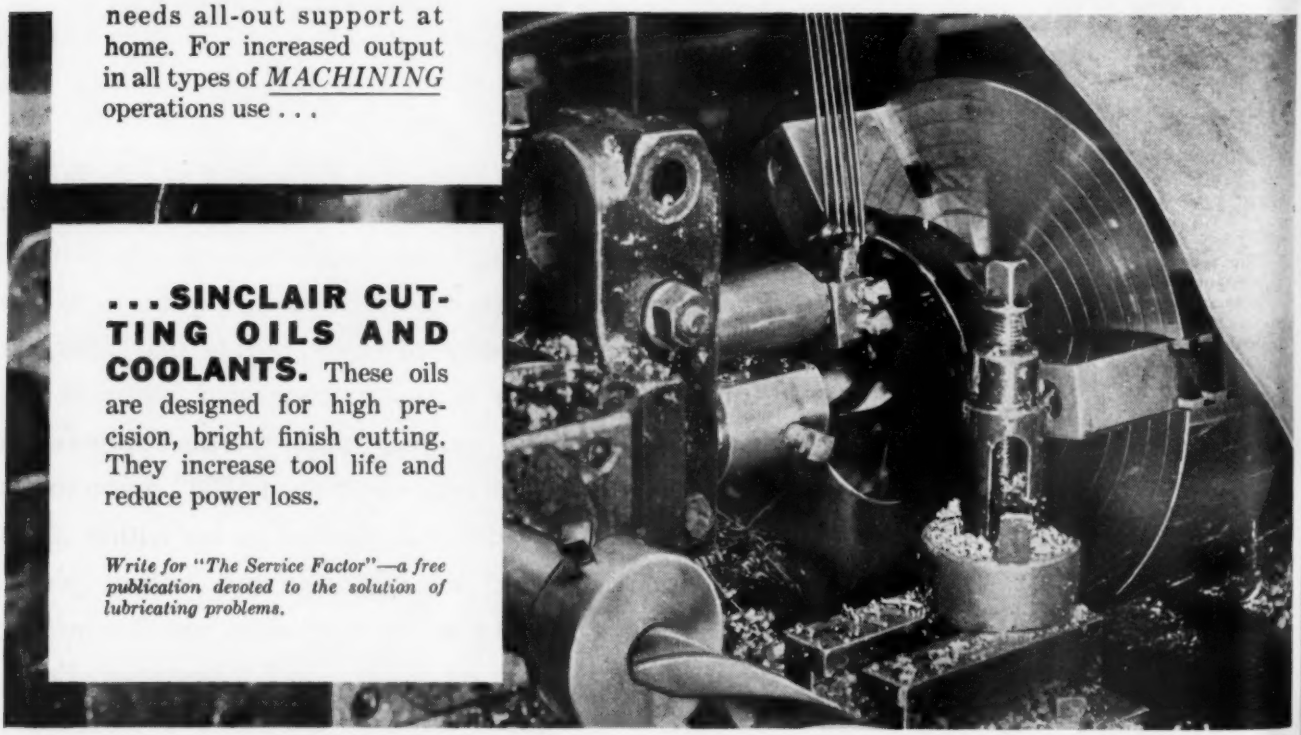
BIG PUSH ABROAD needs all-out support at home. For increased output in all types of *MACHINING* operations use . . .



. . . SINCLAIR CUTTING OILS AND COOLANTS. These oils are designed for high precision, bright finish cutting. They increase tool life and reduce power loss.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

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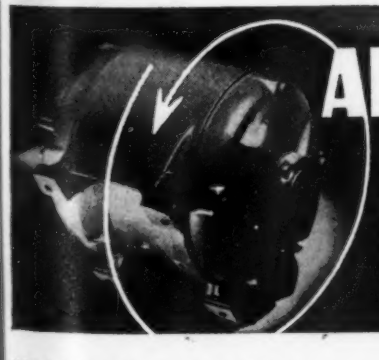
1 Pill for 9 Headaches!

PAGES FROM "A GUIDE TO WARTIME CARE OF ELECTRIC MOTORS"

ALL NINE electric motor enemies are present and accounted for in Allis-Chalmers' new "Guide to Wartime Care of Electric Motors." Streamlined instructions and story-telling pictures describe what they are, where they're found, how to fight them.

Designed for wartime U. S. industry, "Guide to Wartime Care of Electric Motors" has aroused such world-wide demand that Spanish and Portuguese editions are now printing!

You'll find this valuable new handbook ideal both for training new men and "brushing up" old hands. It contains no advertising. Write today for *your* free copy of this tremendously successful handbook to ALLIS-CHALMERS MFG. CO., MILWAUKEE, WISCONSIN. A 1625



ALLIS-CHALMERS MOTORS

When you do need new motors, look into the strength, solidity and all-around protection of the new "Safety Circle"—protected top, sides, ends and bottom.

AC WE WORK FOR VICTORY WE PLAN FOR PEACE

SUNICUT

Increases Tool Life 20% . . . Produces Better Finish

Prolonging the useful life of tools has become a wartime duty as well as "good business" . . . and a major factor in determining tool life is the cutting lubricant. Many metal working shops have discovered that SUNICUT, the clear, free-flowing oil, not only improves the finish and decreases costs . . . but also adds valuable hours to the life of cutting tools.

In one large New England plant, engaged in vital war production, a change to SUNICUT on their multiple-spindle, automatic screw-machines resulted in an increase of 20% in tool life — helped them get as much work out of every five tools as they previously obtained from six. They secured an average run of 8 hours between tool grindings. Down-time was reduced . . . production was increased . . . and the finish was greatly improved.

Such results, and even better, are not uncommon for plants which have switched to SUNICUT . . . the transparent, sulphurized cutting oil with exceptionally high metal-wetting and heat-absorbing qualities. For proof of what SUNICUT can do in your shop call in a SUN Oil Engineer. Write . . .

SUN OIL COMPANY · ***Philadelphia***

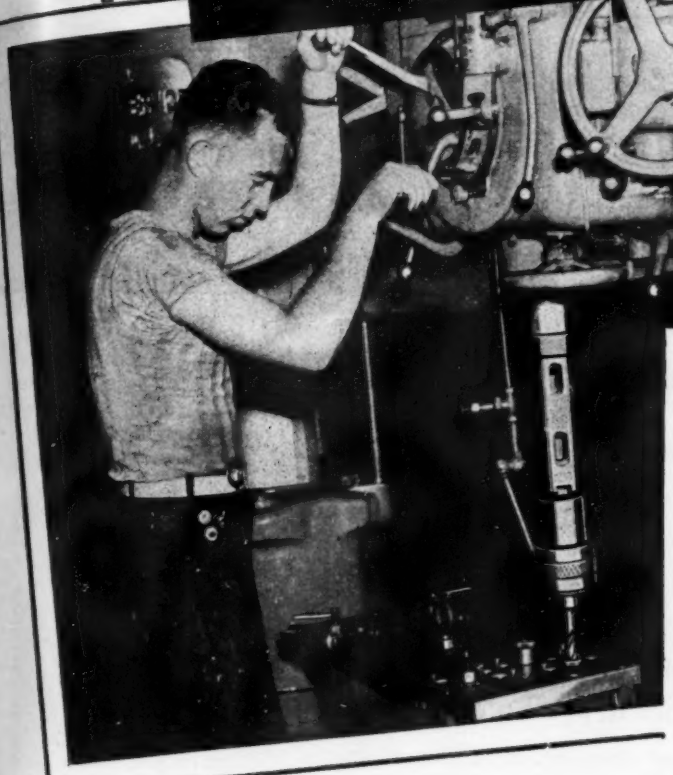
Sun Oil Company, Limited, Toronto, Canada

SUNOCO

SUN INDUSTRIAL PRODUCTS

HELPING INDUSTRY HELP AMERICA

The Cincinnati Bickford SUPER SERVICE RADIAL



..has what it takes to help BUILD SHIPS fast!

Marine engine output must keep pace with record-breaking shipbuilding . . and American plants engaged in marine engine production are more than fulfilling their contracts. Vitally important in this production program are the numerous Super Service Radials now engaged in shipbuilding and kindred operations, of which a good example is illustrated in the above photograph. The job shown, as performed in a prominent eastern plant, calls for drilling a number of holes to exact locations in high pressure blade rings for Marine Turbines. Although production figures cannot be published, it is obvious that the Super Service Radial has what it takes to help maintain the record-breaking pace in American shipbuilding practice.

ARMY E NAVY
AWARDED SEPT. 10, 1942

Full details concerning the advantages of Super Service Radials will be sent upon request

SUPER CB SERVICE

THE CINCINNATI BICKFORD TOOL CO.

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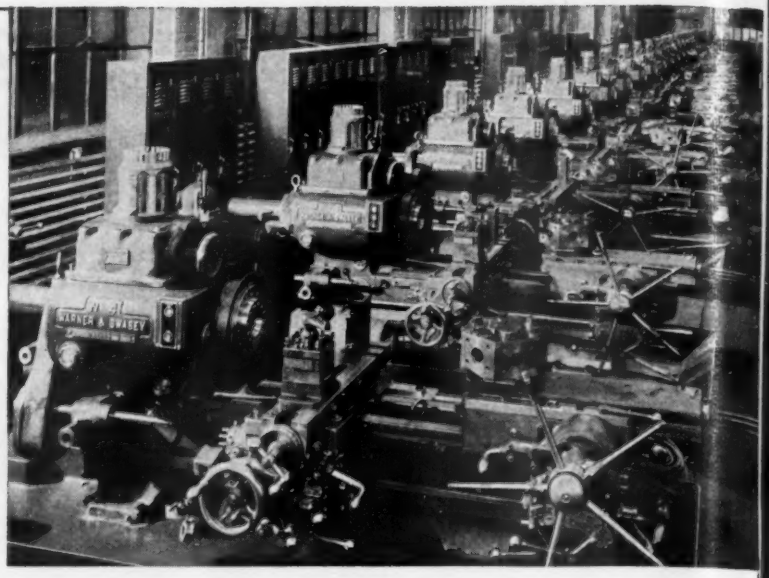


400,000 Friends

who will be waiting to give soldiers jobs

While American industry is intent on winning the war, it has an obligation to plan ahead—as the government is doing —so that victory will not be a mockery to those who won it.

The 400,000 machine tools built for war can be the best friends our soldiers have when they return someday. If these machines are distributed quickly *and wisely* from war plants to peace plants, they can start turning out the goods to meet dammed up demand. And in meeting it, they'll provide jobs without which that demand will dry up and so start a depression.

These machine tools are badly needed in thousands of American plants whose tools are old, inefficient, wasteful. These newer tools would help such plants turn out goods at lower costs—which broadens markets, makes workers' jobs more secure, provides more good things of life for more people.

Jobs and better living for all who will work efficiently . . isn't that what everyone wants after the war? Then plan your machine tool needs now, so that you will be ready to provide your share of both those prizes of peace.

YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

WARNER & SWASEY Turret Lathes Cleveland, Ohio U. S. A.

WHAT'S IN THIS ISSUE

CONVERSION OF SKILLS

The pressure of war production has brought into factories men and women who never before experienced industrial employment. To expedite the changeover and aid in fitting a properly qualified worker to each job, skills and dexterities have been analyzed so that the nimble-fingered violinist may be speedily adapted to fine assembly work, while the ornamental stone lathe operator is readily trained to the milling machine. Conversions of skills makes placement easier for the employer, reduces training time and enables the new employee more quickly to acclimate himself to his new type of work. Page 87.

C. L. PATTERSON

LT. COL. TURNER

STEEL CARTRIDGE CASES

In the Armament Section, an article on steel cartridge cases tells of their development from the pre-war experimental stage through many unsuccessful tries to their present state of perfection. Explained are the three requirements which must be satisfied if steel cases are to be produced satisfactorily. The account of this development was written by two who have been intimately connected with it: C. L. Patterson, general manager, Corcoran-Brown Lamp Division, The Electric Auto-Lite Company, and Lt. Col. Harold R. Turner, Cartridge Case Industry Committee, War Department. Page 113.

CHOOSING A CLEANING METHOD

Three metal-cleaning methods are described by C. W. Smith, research engineer, Alkali Division, Detroit Rex Products Company. A study of his analyses will make easier the choice of an installation to meet a particular cleaning problem. Page 101.

ROLLS FOR FLAME HARDENING

Flame hardening cylindrical surfaces has been speeded and made far more flexible by rotating the workpieces on rollers. Through the use of this arrangement, parts of varying circumferences may be hardened simultaneously and removed separately. The arrangement is used by the Brewster Company. Page 95.

STAINLESS IS DIFFERENT

When it comes to arc welding, torch technique must be altered to fit the characteristics of stainless steel. There are pitfalls to be avoided but by following certain precautions excellent results can be obtained. Charles Pettit, Harvey Machine Company, gives the benefit of his experience with this process. Page 96.

HAND STAMPING STOPPED

Hydraulic connection nuts were distorted when stamped with a hand punch and hammer. This troublesome and tedious operation was added to the screw machine set-up, completely eliminating a cause of spoilage and saving 100 percent of the hand time. This is only one of the many good ideas developed at the Inglewood Plant, North American Aviation, Inc. Page 90.

R. J. DARNTON

FORGINGS FLOW FASTER

Robert J. Darnton, Buick Motor Division, General Motors Corporation, presents the story of that organization's success in producing aircraft engine parts in its forge shop at Flint. He tells how they reduced the quantity of steel used in each forging, developed methods for utilizing available equipment and produced at a higher rate than under former methods. Page 98.

W. C. WHITTUM

CAST CUTTER BODIES

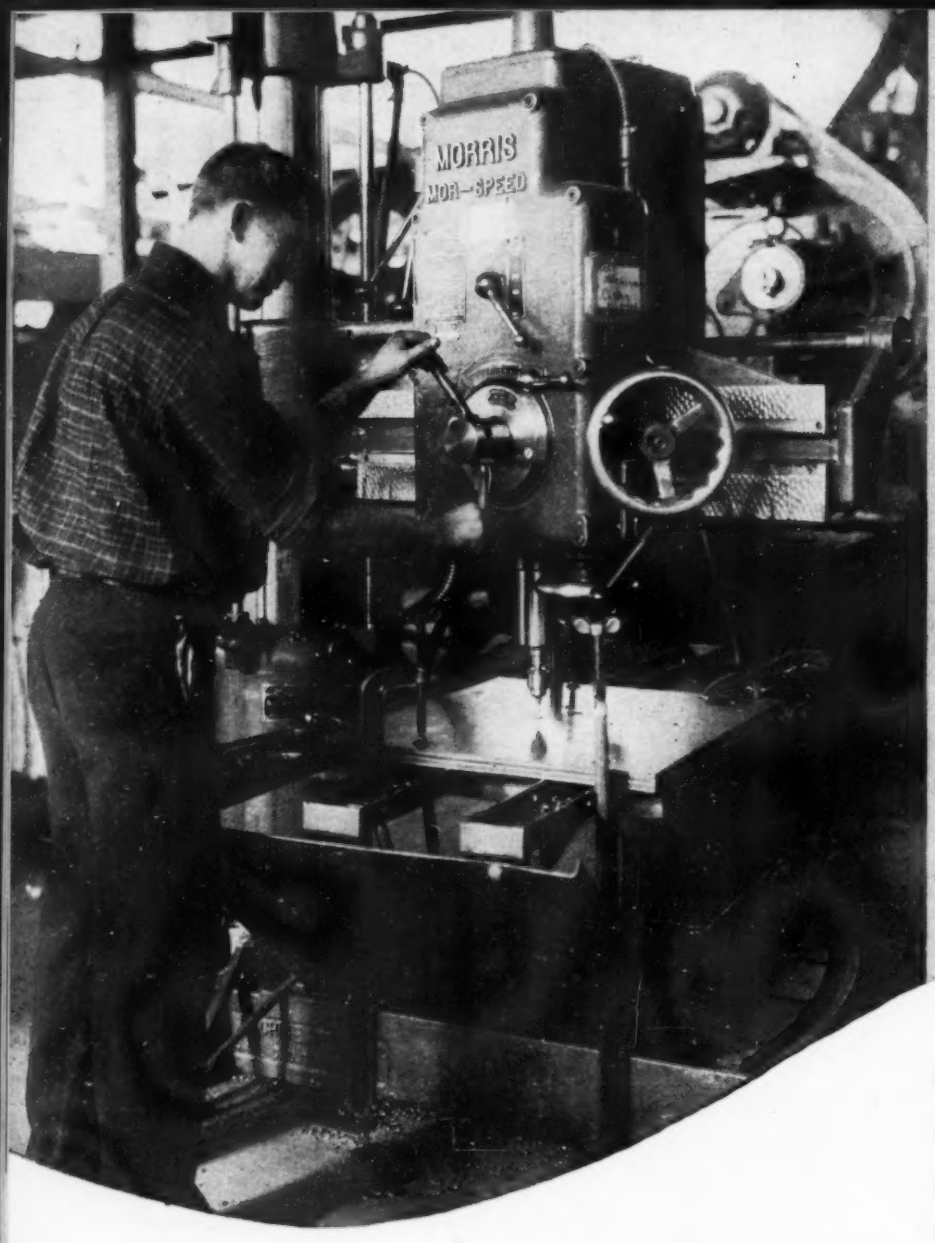
One way of saving steel is to use cast bodies for milling cutters. But instead of being a wartime makeshift this practice has led to tool designs that have made big boosts in production. An article by Warren C. Whittum, machine shop superintendent, Farrel-Birmingham Company, gives all the details of the use of this production-boosting and material-saving method. Page 92.

INSPECTION TIME CUT

Some parts take days to inspect. This was true of a casting which had 54 holes for ball-bearing fits used for a war product. A well-designed fixture using dial indicators cut inspection time to one hour and smashed another bottleneck. It is described by Henry Bernadt, General Electric Company. Page 105.

COMING

A significant development in the aircraft industry is the wide use of stretching presses in fabricating sheet-metal parts. So new is its application in this industry that little has appeared in print about it. One of the first things to know in using stretching presses is how to make the form blocks. C. L. Fenn, chief tool engineer, Edo Aircraft Company, will supply the answer in an early number.



Another MORRIS MOR-SPEED RADIAL advances on a vital objective on the home front

● In hundreds of war plants throughout the country—in shipyards—and on many of the ships themselves Morris Mor-Speed Radials are meeting the diversified urgent requirements of a country at war.

Illustrated is a Morris Mor-Speed Radial in the plant of one of America's prominent manufacturers drilling small holes at various center distances to help keep vital production rolling to our nation-wide war fronts.

The ease of control—the concentration of feeds and speeds in the head—the power and ruggedness of Morris Radials are points of construction that make for greater production and sustained accuracy so essential to our war program.

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For Greater Production, For Dependable Accuracy, For Lower Costs—Specify Morris Mor-Speed Radials for your work.

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Pratt & Whitney Exclusive Agents for the United States

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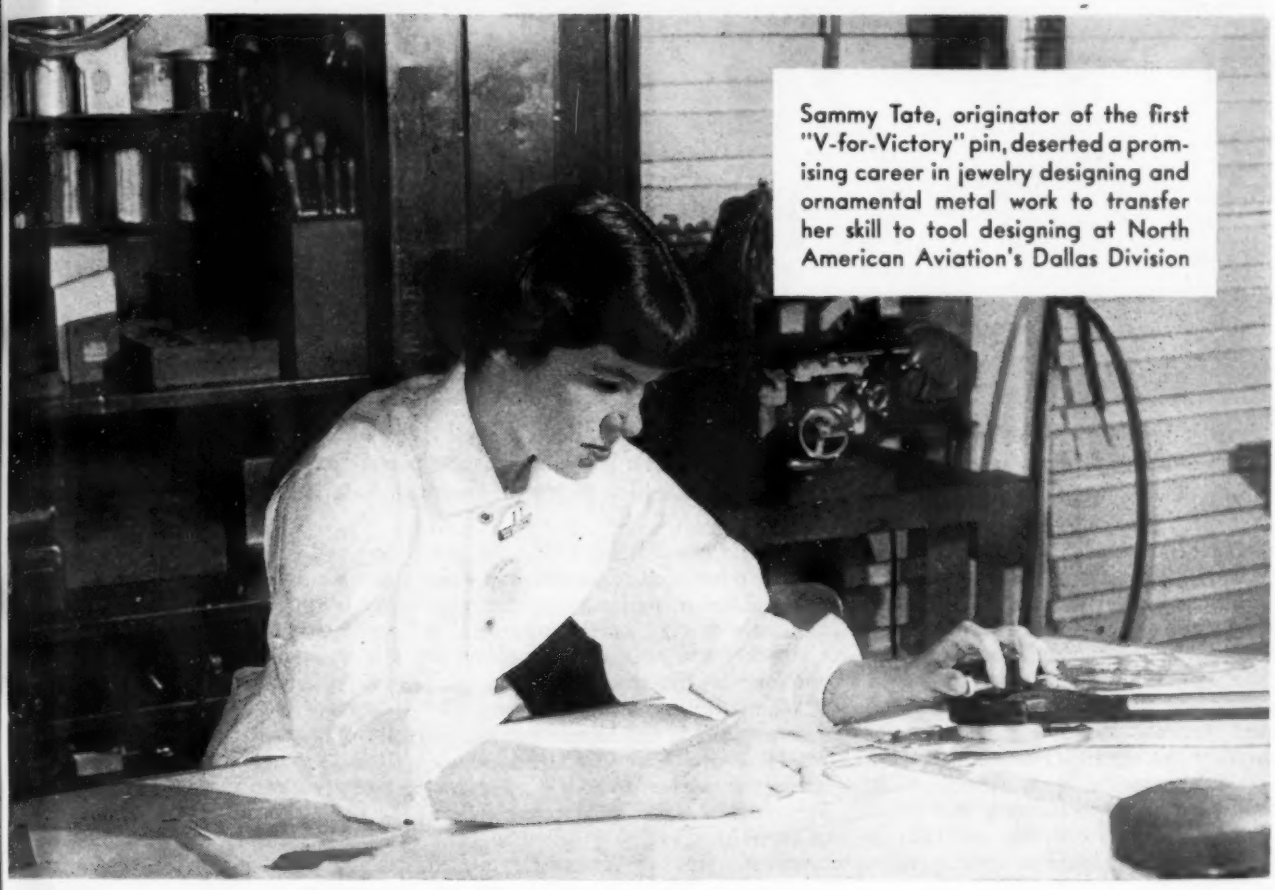


Sammy Tate, originator of the first "V-for-Victory" pin, deserted a promising career in jewelry designing and ornamental metal work to transfer her skill to tool designing at North American Aviation's Dallas Division

Conversion of Non-Essential Skills Fills Essential Jobs

The demand for skilled workers for war production is greater than the supply; so workers from non-essential industries are being classified by abilities and fitted into war production vacancies

"NO, WE CAN'T furnish you a small parts inspector, but we could send you a manicurist."

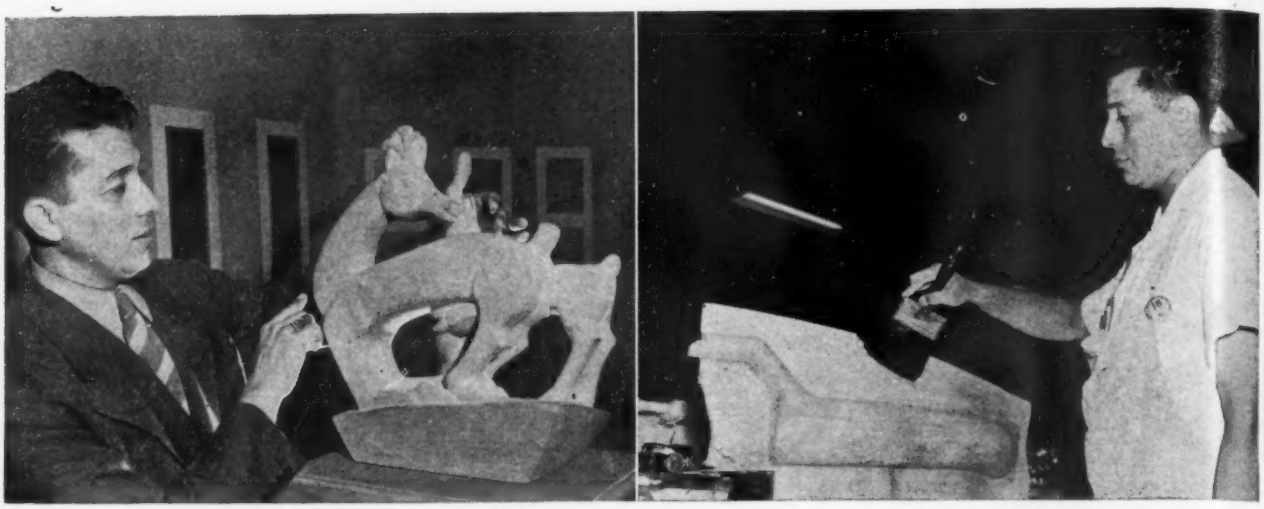
That's just the sort of conversation that's going on every day between personnel departments and employment services. As trained workers become increasingly scarce and the untrained are being drawn into industrial employment, attention is being given to the problem of intelligent conversion of skills. A person skilled in fine jewelry work is already partly trained for assembly of precision instruments; a sculptor is excellent material for the preparation of experimental models.

With nearly 70,000 separate jobs cross-indexed as to skills and physical and mental requirements, the War Manpower Commission is aiding personnel directors in the conversion of workers to war production. Each job is analyzed with regard to the types of skilled workers who could be easily adapted to handle it, and with regard to the types of work which a person leaving that job might be qualified to perform.

To meet this need, The Division of Occupational Analysis and Manning Tables of the Bureau of Manpower Utilization of the War Manpower Commission has created "job families," which indicate plausible lines of transfer from one occupation to another.

To facilitate transfer and to aid interviewers, WMC has indexed each of the jobs it has analyzed. Indexing is by means of punch cards, which enable workers quickly to derive a list of co-related skills.

As the basis of a "family," the job concerned is studied in each of several geographical locations and analy-



Artistic hands of Octavio Medellin, noted Mexican sculptor, have shaped many widely-exhibited pieces of art, such as "Dawn" with which he poses (left). Those same artistic hands now shape plaster patterns for die molds (right) in the foundry at the Dallas Division of North American Aviation

sis schedules are submitted. These schedules specify the types of job and industrial characteristics such as the basic process involved, the tools, machines, equipment and materials used, the education and training required. They are accompanied by listings of the various kinds and degrees of worker characteristics required for successful performance on the job. Consolidated and summarized, this information supplies the data necessary to relate jobs according to the four categories previously described.

Job Families by Industries

Each job family draws together the occupations related to a single industry, along with the various types of jobs that may be converted to each of them. The information is mimeographed and bound together for the guidance of personal workers.

The opening page of each job family publication contains a general statement of the purpose of the data and instructions for their use. It also outlines briefly the important knowledge and ability requirements of the base job, which were used in the selection of related occupations.

Succeeding pages of the job family are divided into graded tables, giving jobs that are most nearly related, those that are closely related within the same industry and those having certain similarities in different industries.

In the table headings are indicated the part of the work which has been matched and the worker characteristic requirements which have been found to coincide with those required in the base job. In some instances it has been found necessary to point out other requirements which have not been matched but are considered important. Consideration of age, sex, race, or other such requirements are not incorporated in job families, since they are likely to vary widely from locality to locality and even from employer to employer in the same locality.

When the use of job families was first instituted, employment managers would ask, "Why pick and choose when we need everybody?" But hiring trainees with little consideration of their background, resulted in great turnover, for workers were placed in jobs for which their backgrounds did not suit them, and hence they didn't like the work. The use of job family cut turnover.

To illustrate the operation of the job family, let us assume an order is received for an engine lathe operator, in which classification there is a shortage of workers; and further let us assume that the employer has indicated his willingness to accept related workers. In making selections, the interviewer will first go to the panel where fully qualified workers should be found, either in primary or supplementary classifications.

Failing to find any available, he will turn to Table II to determine whether workers are available in the panels of related occupations, including such as turret lathe operator, milling machine operator and boring machine operator. However, there is also a shortage of workers who have experience in these occupations.

The search through Tables I and II having proven futile, because of labor scarcities among engine lathe operators and allied occupations, job family materials may aid in locating related classifications where the relationships are more subtle or do not appear on the surface.

Search by Tables

To carry on the example, Table III of the job family for engine lathe operator reveals that a locksmith is related because his is one of a series of occupations involving the forming and cutting of metal by machine, requiring of the worker manual dexterities and coordinations similar to those required in machinist work and further involves the use of blueprints or machinists' measuring devices. At the head of the table are presented the specific job and worker characteristics held in common between the base job (in this instance, engine lathe operator) and the related jobs (including locksmith).

The factors determining job relationships have been grouped into four main categories:

1. The basic process involved in the job, or as it is generally called, the nature of the work done;

2. The pattern of worker characteristics required by the job, such as high degree of accuracy, above-average finger dexterity, unusual strength of arms, etc.:

3. The tools, machines or other equipment used on the job. Also the reading of blueprints, use of special measuring devices, or special equipment may be involved.

4. The basic material worked upon or with. Occupations may involve working with more than one material, or working with the same material in different forms.

Table IV includes potentially qualified workers, as stone lathe operators who might be acceptable to the employer on the basis of similarity of work, despite difference of material. It is possible that in Table IV might be found occupations having more in common with the base job.

Has Proven Value

That these conversions are practical is testified by hundreds of working instances. In one instance, a company producing tanks was in need of metal planer operators. The United States Employment Service knew that many stone planers were out of work because of the depression of the building trades. Their services were offered, and the employer accepted a few reluctantly. Today 40 are employed, one of whom is now foreman of the shop.

Linotype operators, because of their dexterity and precision of finger work, are successfully doing rapid assemblies.

House carpenters have been converted to wood patternmakers, bricklayers and stone cutters to machinist trainees, and tile setters to shipfitters.

Hairdressers and manicurists have been successfully converted to assembly and inspection of small parts. Jewelry inspectors and mechanics have transferred their skills to small parts inspectors and assemblers.

Flower makers, experienced in utilizing cutting dies to stamp designs from fabric, now operate drop hammers producing metal parts.

Experience in metal working was the basis for the successful conversion of a silverware spinner to work on a high-speed lathe.

While it did not secure them through WMC aid, North American Aviation, Inc. includes on its Dallas plant payroll many whose peacetime skills stood them in good stead when they left their regular occupations to take war production jobs. From the fields of arts and decorations came a designer of smart jewelry and intricate ornamental metal work, now employed as a tool designer; an expert repairer of broken china who now works as a welder; an interior decorator specializing in curtains and drapes who applies her sewing skill in the fabric department; one who made plaster art objects and now wields a welding torch; and two artists—one of whom now makes production illustrations, using his special technique to give depth to drawings, the other of whom is a famous abstract artist and draws intricate die patterns from blueprints.

Two of North American's welders were handicraft teachers whose peacetime experience aided them in quickly learning to be welders.

From the field of music, North American has drawn three whose nimble fingers aid their new employment: a former symphony orchestra violinist now welds small parts; a former harpist and piano teacher now inspects machine parts; while a nimble fingered flutist now wires fuse boxes in the electrical subassembly department.

Lockheed Aircraft Corporation found that many new employees brought with them valuable skills they had gained in the pursuit of spare-time hobbies. An interviewer was able to place a business man in a good job as a jig builder because his hobby was wood work, whereas his particular business experience was of no great value to the war plant.

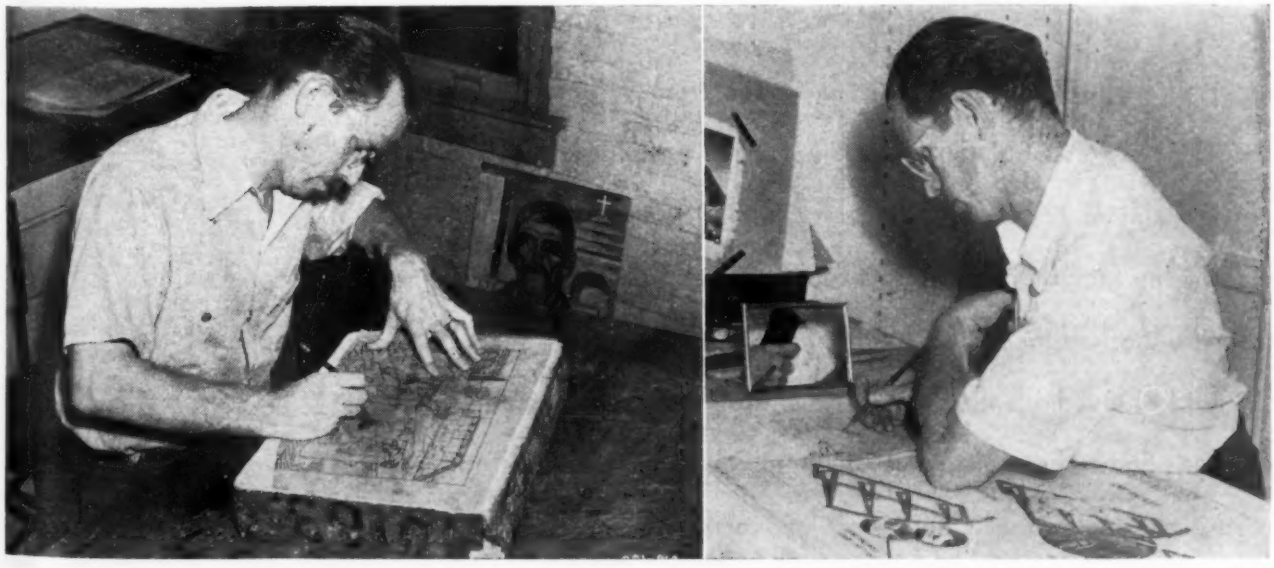
Salesmen, according to Lockheed officials, usually make good dispatchers and expediters, because they are used to handling people. A watchmaker, or other craftsman used to doing precision work, can often do testing and repairing, precision work or minute assembling.

Millinery to Munitions

An electrical detail assembler at Vega Aircraft Corporation was formerly a milliner and dressmaker; her peacetime background has proven valuable for some of the delicate assembly work she does. A former lamp shade maker, now employed in Vega's precision assembly department, has found that her previous employment gave her the required deft touch. For much of the work in detail assembly departments, the hands of former housewives, milliners, and beauty operators are especially adaptable.

A famed Italian-American sculptor is now making plaster patterns for P-38's and Hudson bombers at Lockheed Aircraft.

With trained workers in war production lines almost impossible to find, industry is making a scientific approach to selecting the worker who can be trained with the least amount of effort and time. This approach cuts down misfits, reduces labor turnover and absenteeism and reduces training outlays of time, money and effort. The net result: more war production, quicker.



During prewar years, Alexander Hogue's painting of the nation's Southwest gained him country-wide fame, while his lithograph prints (left) became nationally prized. Today he prepares "third-dimensional blueprints" (right) in the production illustration department of the Dallas Division of North American Aviation

Ideas from Inglewood

Most of the articles on aircraft manufacturing methods, have shown moving assembly lines and giant sheet-metal presses. These are the glamor spots of the industry; but they should not overshadow the fact that the aircraft tool engineer has also improved machine shop methods. He has improvised devises less dramatic, but not less ingenious than some of the more photogenic assembly fixtures. Shown here are some of the novel machine set-ups now used in the Inglewood, Calif., plant of North American Aviation, Inc. They are evidence that the tool engineer is on his toes.

The design of a hexagonal nut calls for identifying letters on two faces to aid in distinguishing hydraulic lines. Formerly these letters were applied with a hand punch—a tedious operation and one that was likely to distort the nut if the punch was struck too heavily. An attachment to a Brown & Sharpe screw machine on which the nuts are made adds the lettering while the part is being turned.

The attachment replaces the spindle nose plate and is threaded to fit the spindle. It contains a hexagonal opening through which the bar stock passes. Two radial punches are located 180 deg. apart in the attachment and are held clear of the stock by means of springs. The ends of the punches protrude about $\frac{1}{8}$ in. above the outside diameter of the attachment.

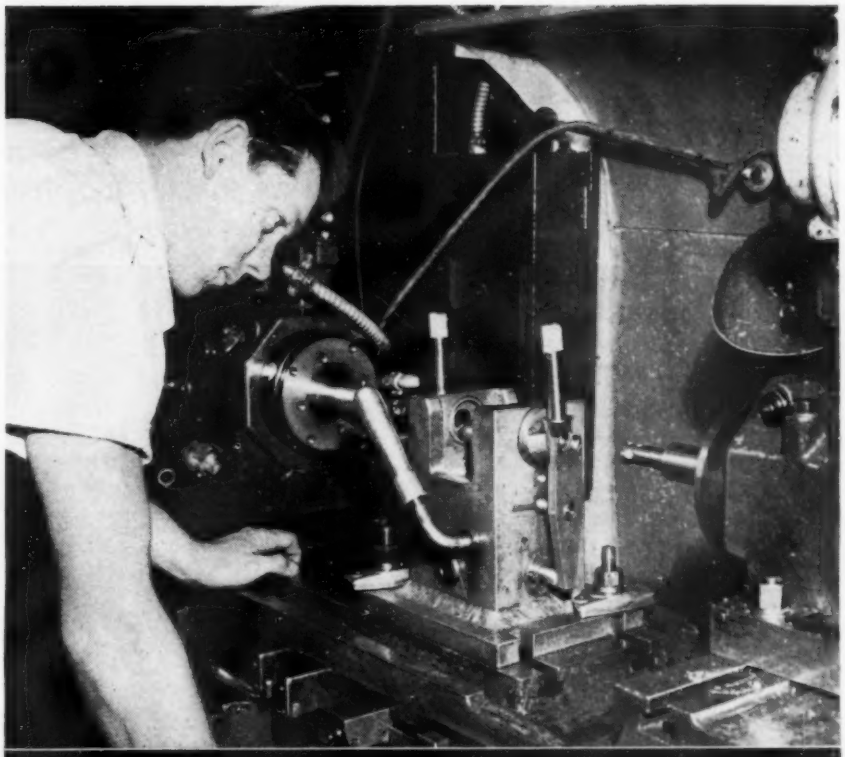
A hardened roller is held in a block which attaches to the back toolpost. When the roller is brought against the outer end of the stamps, it forces them inward, causing them to mark the work. Since the back toolpost is ordinarily used for a cut-off tool, special provision is made on the roller block for holding this tool also. It will be noted that the nut is marked before it comes into the working position in the machine, and hence before it is drilled, tapped and cut off. Marking the bar before machining avoids all possibility of distortion.

Formerly four persons were engaged in hand stamping the nut. By combining this step with the cutting-off operation in the screw machine set-up, 100 percent of the time was saved.

A novel device developed for an Ex-Cell-O precision boring machine controls the clamping of two special eye-bolts. The work pieces are held in circular recesses near the top of the fixture. The clamps are hinged at the center and are locked by the movement of horizontal pins at the bottom. The clamping action is controlled by a single lever which has two operating positions, right and left.

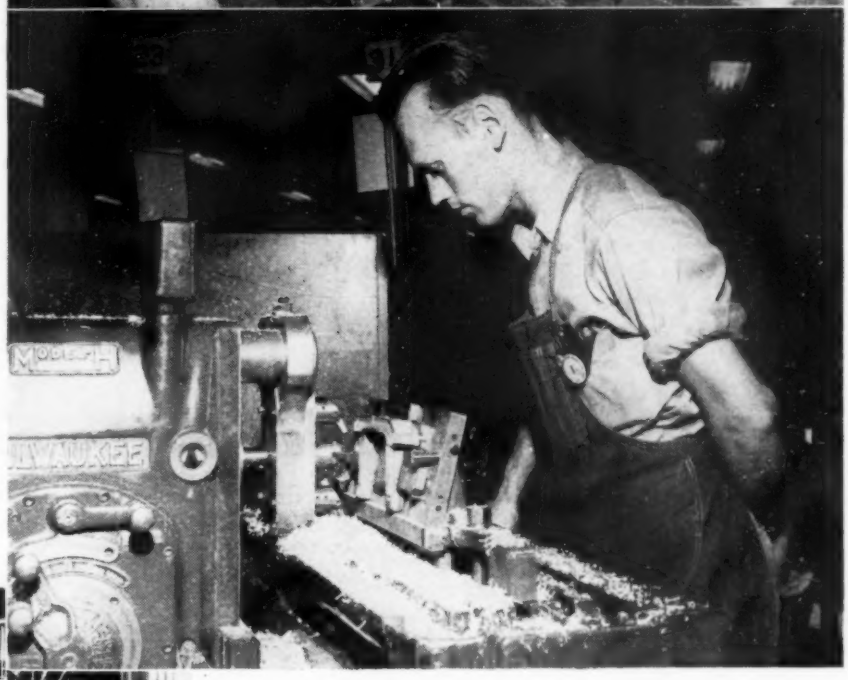
A unique feature of the fixture is the motion produced by the clamping lever. For example, if both work pieces are in place and the left-hand one has been completed, the sequence of movement would be as follows: lever left, left-hand part released; lever right, left-hand part clamped; lever left, right-hand part released; lever right, right-hand part clamped.

In short, the mechanism is arranged so that the work piece under cut remains clamped through two successive shifts of the operating lever. The same type of fixture has been employed on a variety of other parts.



Three fly cutters are used simultaneously on a duralumin wing part by means of a special spindle head applied to a Kearney & Trecker milling machine. The head is clamped to the machine overarm. It carries three spindles; the center one is in line with the machine spindle and is driven by it. The upper and lower spindles are geared to the center one and revolve in a direction opposite to the center one.

Use of the head permits cutting surfaces in three planes at the same time. Because of the angular position of these surfaces, the work piece is held in a simple slanting fixture. A set gage on the fixture controls the depth of cut.

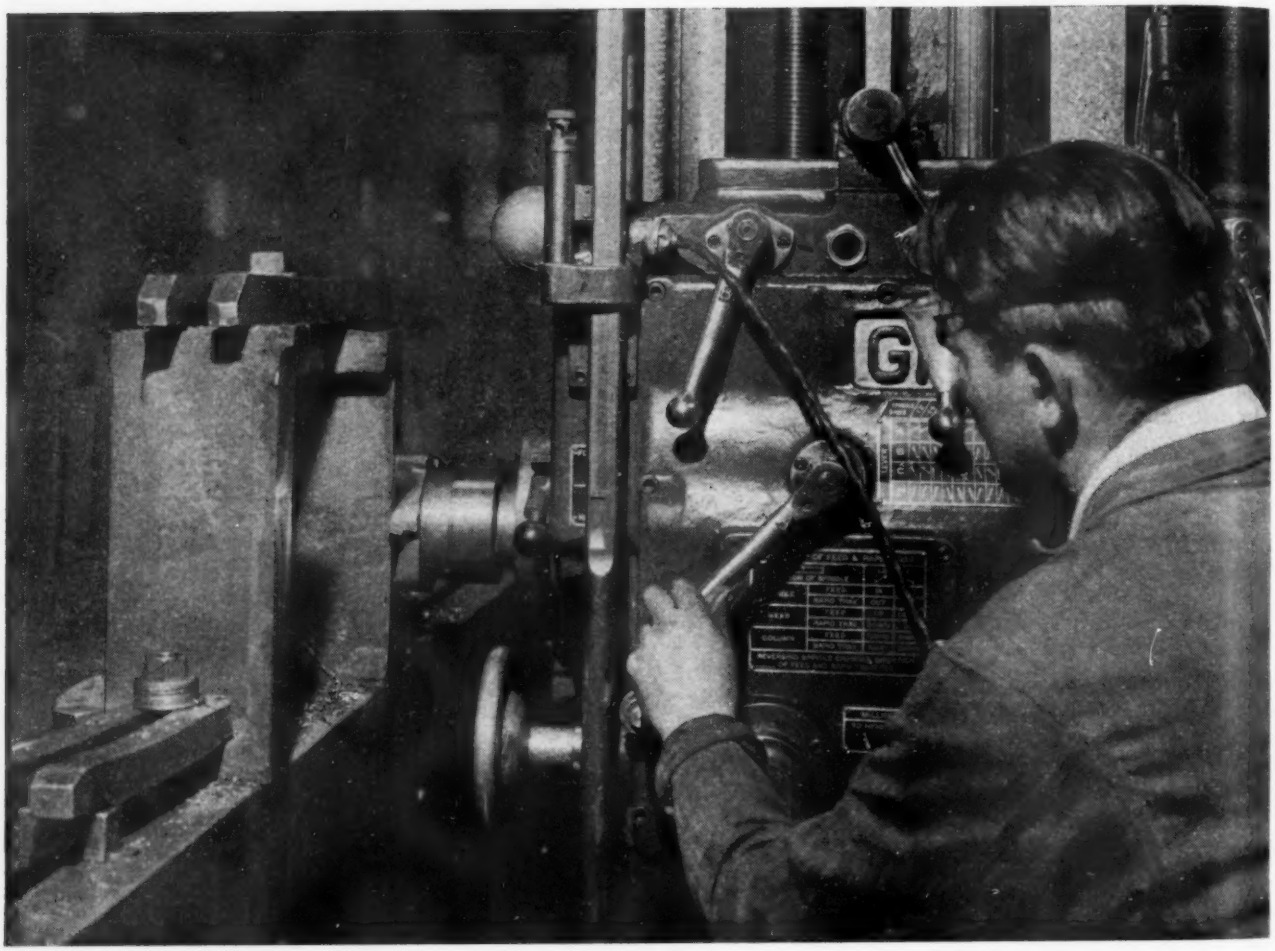


A handy speed clamp holds a wide variety of aircraft work for drilling and tapping. Previously a dog was used for the purpose. The new clamp avoids the use of a wrench in locking the part for machining and has speeded operations by nearly 50 percent.

The clamp consists of a vertical post mounted on a horizontal base which is bolted to a T-slot in the drilling machine table. The clamping element is in two parts: a fixed plate which can be locked at any convenient height, and the clamping arm itself which is hinged to the plate. Clamping action is obtained by pressing downward on an eccentric lever. Note the hardened guide at the back of the drilling machine table. This guide locates the work jig and is standard equipment on all drilling machines in this shop.

Cast Cutters Boost Milling Capacity

BY WARREN C. WHITTUM, MACHINE SHOP SUPERINTENDENT, FARREL-BIRMINGHAM COMPANY



A 6-in. Meehanite cutter is used on a Gilbert horizontal milling machine for high-speed finish milling of a steel cover. The carbide-tipped cutter runs at 600 r.p.m. at a feed of 8 in. per min., and a 0.005 in. depth of cut

The combination of Meehanite bodies and brazed tips forms a ready supply of tools for an expanded milling machine department, saves critical high-speed steel, expedites solution of special problems

IT TAKES plenty of milling cutters to keep milling machines running on a 24-hour schedule. We found this out a year ago when our milling capacity was trebled by the addition of new planer and knee-type milling machines. Not only did these machines need additional face mills of 6, 8, and 12 in. diameter, but the wider variety of materials to be machined disclosed the inadequacy of existing cutters designed primarily for milling cast iron.

This combination of more machines operating around the clock, working on harder materials, soon created a serious problem to keep machines running efficiently.

It was impossible to obtain new milling cutters as it meant months of delay in delivery. In addition, the material to be machined ranged from frail weldments of low-carbon steel to high-strength Meehanite and heat-treated steel forgings. Existing cutters did not produce a good finish on soft steel, and would not stand up against the harder materials.

Our solution to this problem came unexpectedly. We had been using Meehanite tool shanks on our lathes and boring mills, brazing on a variety of cutting tips. If Meehanite worked as a single-point tool shank, why not as a milling cutter body?

For our first cutter, we took a round wooden blank and carved out a few teeth by hand as it was impossible to draw just what we wanted for the patternmaker. After cutting and trimming here and there, we turned the

blank over to the patternmaker, who made up a complete pattern for an 8-in. body. Next we made a casting of Meehanite, bored and faced the mounting hub, and then milled the teeth and brazed carbide tips into place. To finish the cutter it was only necessary to grind the cutting tips according to usual practice.

For the next week or so this cutter served as a guinea pig. We tried it on the finishing of soft steel and it produced a finish better than we had ever obtained before. We tried it on high-strength Meehanite and heat-treated forgings, and were able to remove the metal much faster than with ordinary cutters. The finish obtained on these metals was almost like a ground surface.

The success of this cutter was not the whole answer to our milling cutter problem. We next tried additional cutters with different combinations of rake and helix angles, varying from double positive to double negative angles, and positive rake angles combined with negative helixes. Furthermore, we had been using cast-alloy tips on single-point tools, so we tried these tips on our milling cutters, using increased positive rake angles.

For cast iron and brass, we have found the most satisfactory angles with cast-alloy tips to be: 10 deg. positive rake and helix angles; for rolled and cast steel, 10 deg. positive helix angle and 15 deg. positive rake angle.

For cutter bodies tipped with carbide, we generally use 0 deg. helix and rake angles, also 5 deg. negative helix angle combined with 10 deg. positive rake angle.

Cutter Applications

For the past year we have continued our experimental work with various grades of carbides and cast-alloy tips. At present, we are using carbides wherever a high grade finish is required, and for roughing and finishing on brass, iron and steel. We are using cast-alloy-tipped cutters for heavy roughing operations where the

Procedure for Brazing Carbide Tips to Tool Shanks

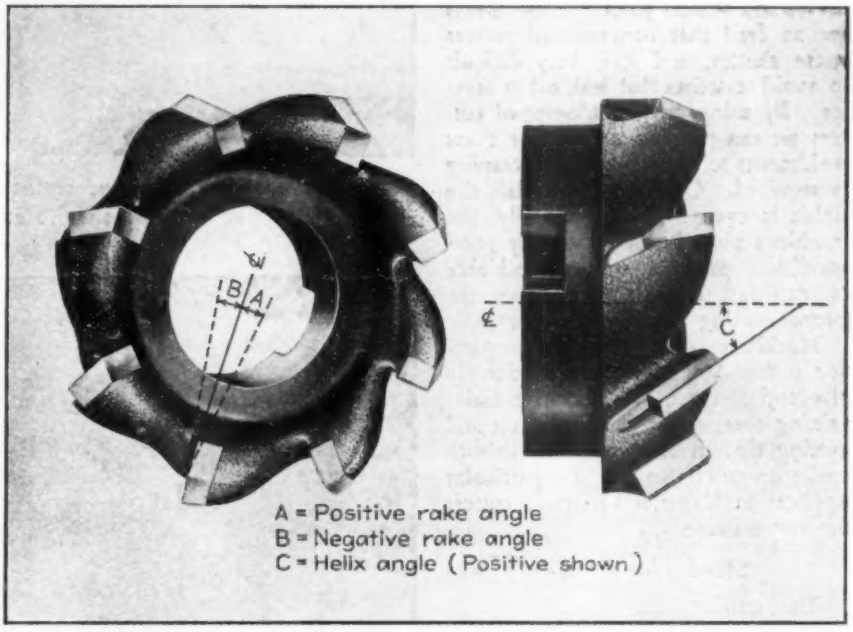
Preparation

1. Mill pocket or recess in tool shank. Pocket must be flat so tip will not rock.
2. Grind edges of tip so it will seat firmly. Clean recess, tip and brazing material with pencil brush dipped in carbon tetrachloride.

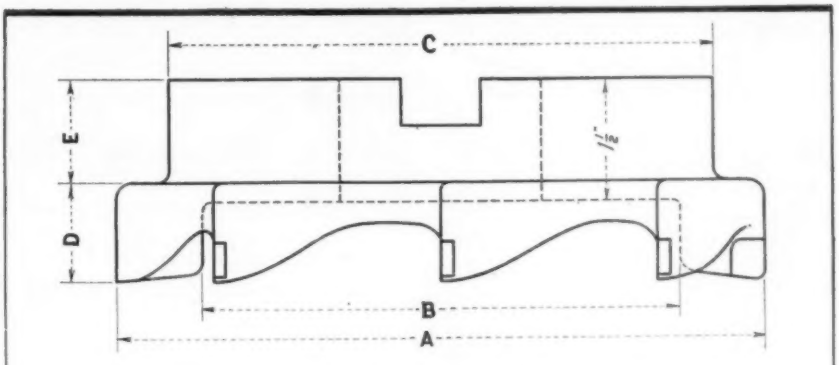
For quantity production the tool bodies or shanks are usually heated in a furnace. Where the quantities are small the parts are heated by acetylene torch. Most manufacturers of carbide tips recommend a low-temperature brazing medium as strip silver solder which flows at a temperature of approximately 1275 F. With this material the original brazing can be done quickly and broken tips can be removed easily.

Procedure

1. Apply brazing flux to recess in shank. Lay brazing material on top of flux and coat it lightly with flux. Insert tip and cover top with flux.
2. Adjust torch to get non-oxidizing flame. It is important to get *uniform heat distribution* under the tip. Therefore, apply the torch flame to the shank underneath the tip, moving the flame back and forth so as not to burn the shank. When the shank becomes a dull red color, indicating the desired temperature, apply the flame to top of tip until that also becomes the same color as the shank.
3. At this stage move tip back and forth slightly to distribute the brazing material evenly under the tip, keeping the flame playing on both tip and shank to prevent setting.
4. Press tip firmly onto shank, then diminish heat so tip will set.
5. To prevent cracking due to variance in cooling of shank and tip, place tool immediately in mica, lime or charcoal so that it will cool slowly. Do not cool in water.



Face-mill patterns are designed so that they can be machined for carbide or cast-alloy tips, and the 6-, 8- and 12-in. cutters all have a 2½ in. hole in the hub



MEEHANITE MILLING CUTTER BODY

	No. Teeth	A	B	C	D	E
6" RH & LH	6	6"	3½"	4½"	1¼"	¼"
8" RH & LH	8	8"	5½"	6¾"	1¼"	¼"
12" RH & LH	12	12"	6½"	8"	1½"	¼"

RH shown — Bore & keyway to suit

casting is rough and stock to be removed is considerable. These cutters will also produce a good surface if ground for finishing.

Our initial objective in making these Meehanite-body milling cutters was simply to break a bottleneck which was holding up production. We would have been satisfied only to get additional cutters equivalent to those which we had been using. Instead, we have been surprised at the additional possibilities encountered in the application of cutting tips to Meehanite bodies.

Smooth, Leakproof Finish

Our most serious problem had been that of getting a good finish on light welded-steel covers for marine gear drives and similar parts. These covers are so frail that conventional cutters cause chatter, and it is very difficult to avoid scratches that leak oil in service. By using our carbide-tipped cutters we can produce a finish on these weldments so smooth that no scraping is required. On harder materials the finish is even better. Naturally, the machines must be in reasonably good condition, properly aligned, and able to run fast enough to produce the proper cutting speed for carbides.

Machining a wide variety of parts for ordnance imposes a variation in size and shape of cutters. By maintaining a variety of cutter castings and cutting tips in stock, we are able to make up cutters to suit the particular application if general-purpose cutters are not suitable.

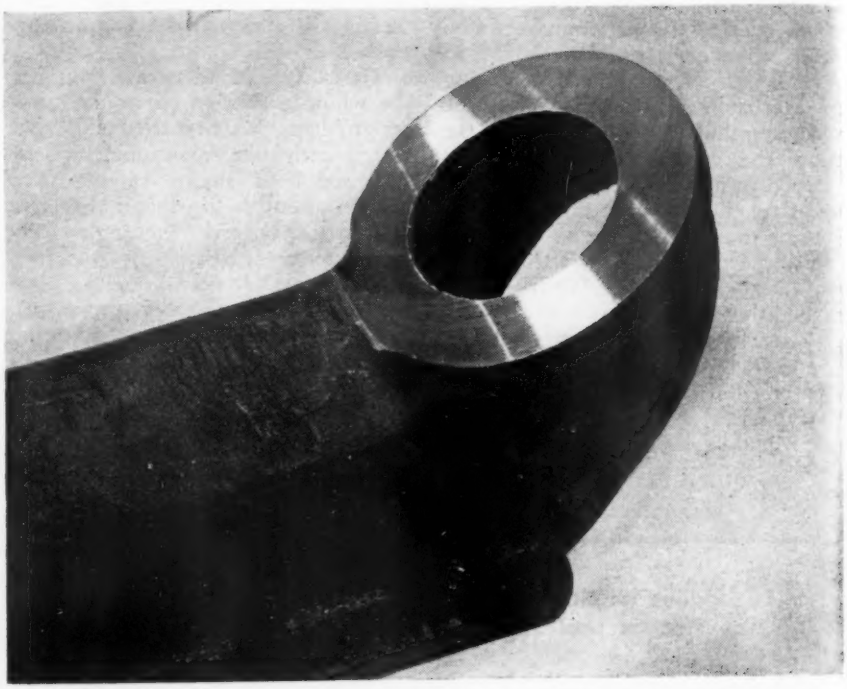
Standardized Hole

The milling-cutter patterns are so designed that they can be milled for carbide or cast-alloy tips within a wide variety of rake and helix angles. Cutters for general-purpose milling are made up in lots and kept in the tool crib ground and ready to use. We have standardized on a 2½-in. hole in the driving hub of our 6-, 8-, and 12-in. cutters, so that any cutter can be used on any machine once the proper cutters adapters are made.

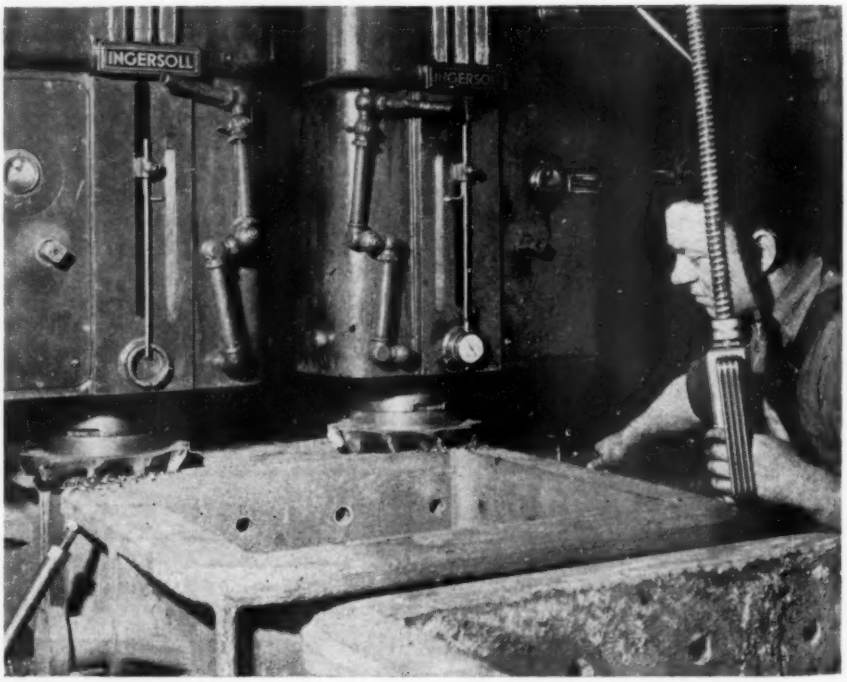
Not only can the cutters be adapted to special requirements, but this can be done in a minimum of time. With the castings in stock, it is only a matter of hours in the toolroom to make up a cutter in an emergency. When difficult materials are encountered, several attempts may be required before the best combination of cutting tip and cutting angles are obtained. In such cases a quicker solution of the problem may mean many days saved in production.

It is probable that new and improved carbides and cast alloys will be brought out from time to time. By brazing these materials to Meehanite bodies it will be possible to carry out experiments on these new materials with a minimum of expense. As soon as improvements are substantiated they can then be incorporated into shop standards with a minimum of delay.

In addition, the simplicity of these cutters makes it economical for the toolcrib to carry in stock a wider variety of cutters. The tip materials and rake angles can be varied to suit different machining conditions, rather than depending upon general-purpose cutters. This circumstance promotes an efficient use of equipment.



A finish almost like a ground surface has been realized when milling high-strength Meehanite and heat-treated forgings



Meehanite flasks are hard and hence the 12-in. Meehanite cutter is fitted with cast-alloy tips, rough mills the work at 20 r.p.m. and a feed of 5 in. per min.

Roller Support Speeds Flame Hardening

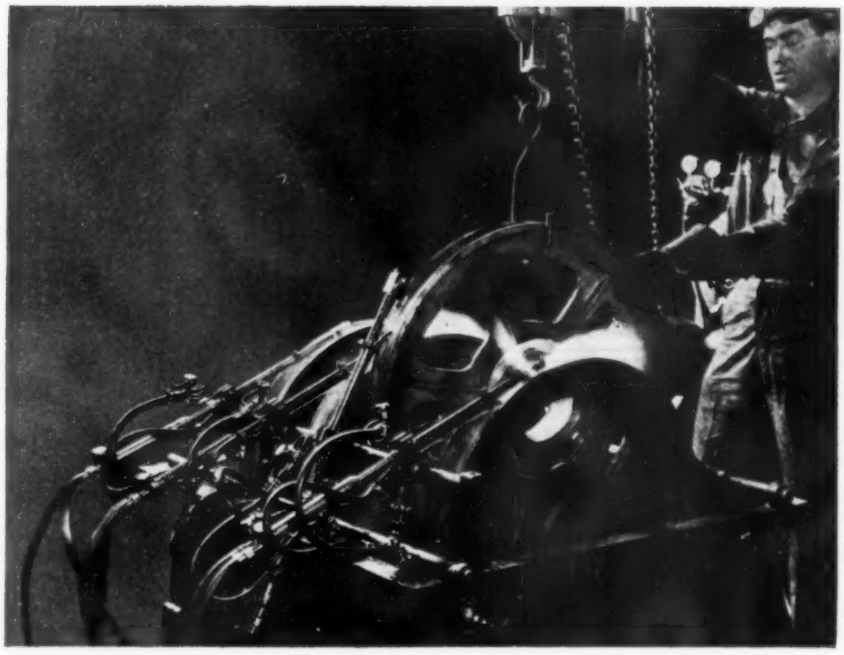
Novel method of work rotation keeps peripheral speed constant regardless of the diameter

AN UNUSUALLY FLEXIBLE set-up has been developed for flame hardening the cable grooves of sheave wheels. The set-up, which is readily adaptable to other jobs requiring the hardening of cylindrical surfaces, was designed for use at the Brewster Company, manufacturers of drilling equipment. It departs from the usual practice of rotating the workpieces on spindles; instead, the sheaves ride on two roller shafts.

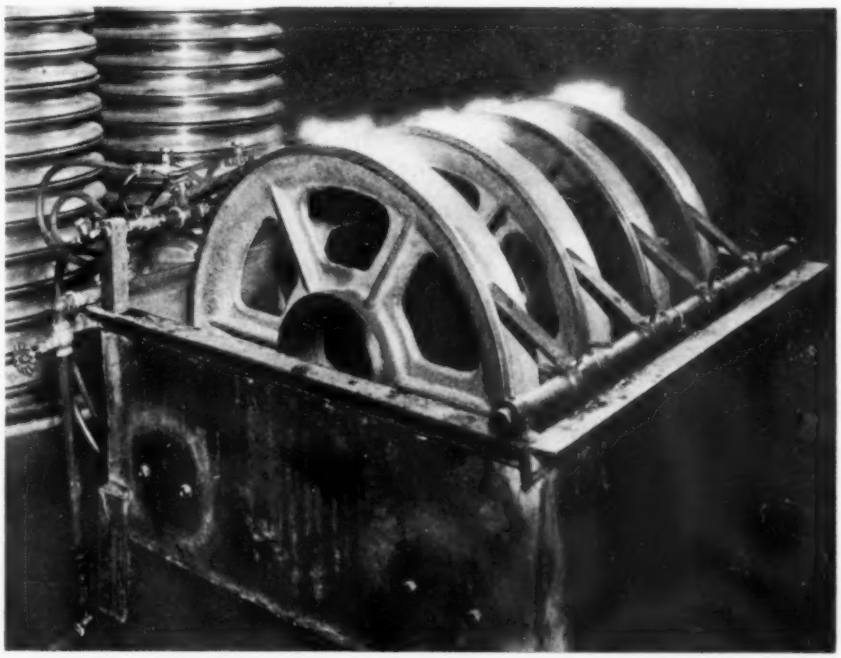
An advantage of this arrangement is that different sizes of wheels can be treated simultaneously, since the circumferential speed of each is constant. Motion past the fixed torches in this instance is 4½ in. per min. Another advantage is that the operator may stagger the work from torch to torch so he can remove a finished sheave while others are still under the oxy-acetylene flames.

In the Brewster set-up, four rotating sheaves are held in alignment by ¼×1½-in. steel fingers fitted into each groove. These guides are kept in place by a collar on either side and held in place by setscrews.

By this arrangement production was stepped up to eighteen sheaves per torch in eight hours. The torches are equipped with special flame-hardening tips carried by water-cooled extension tubes, designed by Air Reduction. There is a secondary quench mounted under the extension of each tip.



Sheaves are lowered into the quenching tank where they are rotated on two horizontal rollers during the hardening operation



Steel fingers hold the workpieces in alignment; each sheave can be started and removed separately

Arc Welding Stainless Steel

BY CHARLES PETTIT, Welding Supervisor, HARVEY MACHINE COMPANY

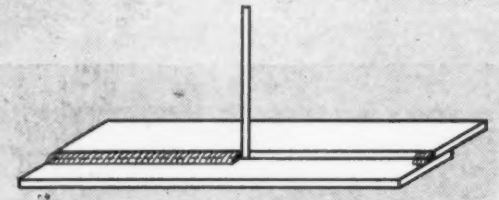


FIG. 1-Hold electrode vertical

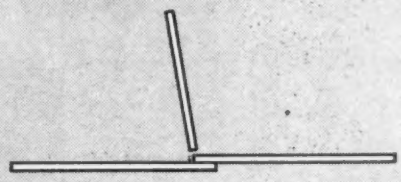


FIG. 2-This position of the rod permits more of the parent metal to make up the weld.

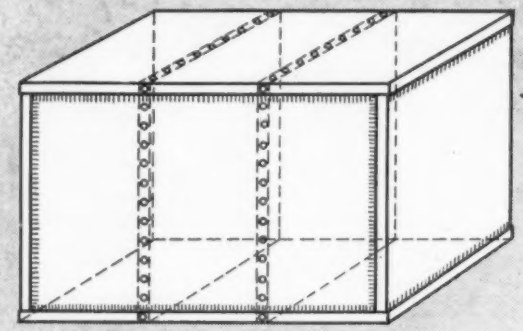
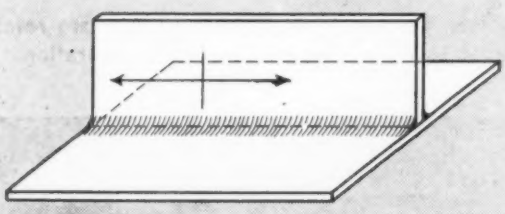


FIG. 3-Lap joints on tanks of 0.40-0.50-in. metal can be welded and rivets can be sealed with 40-amp. 25-volt current



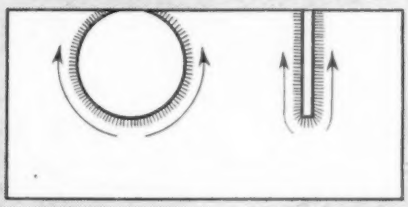


FIG. 4 and **5**-Cracks in parent metal are avoided by starting the weld at the center and working toward the edges.

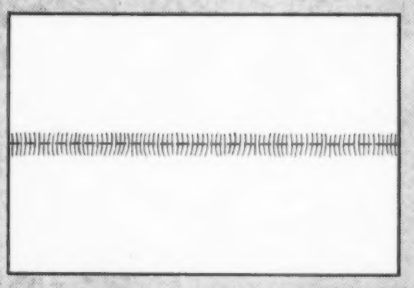


FIG. 6-Butt weld two pieces of 18 gage metal and cut into strips for test specimens

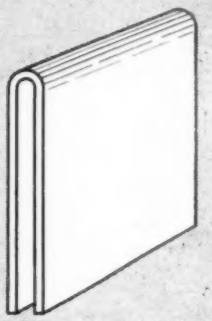


FIG. 7-Specimens 1" wide when polished to remove scratches, can be bent 180° without cracking.

Stainless steel sheet used in aircraft construction and fabrication of corrosion-resistant tanks can be arc welded successfully if the right machine and electrode are used and the proper technique followed. Distortion is negligible, even when welding reinforcing plates and flanges to engine exhaust manifolds

Light-gage parts can be welded electrically without the arc penetrating the metal. Correct technique is the controlling factor in holding down costs

THE INCREASING USE of stainless steel products has created a demand for faster and improved methods of joining parts into subassemblies. Since the majority of this work must be leakproof, riveting is out of the question. In many cases, gas welding is used, which is not only slow but also warps the parts because of the slow heat of the flame. Warpage and subsequent straightening can be eliminated by using the electric-arc process; furthermore, it is fast and produces a weld of excellent metallurgical characteristics.

When welding stainless steel, carbon must be restrained from entering the metal. This is not always the case with gas welding, because an operator may, if he chooses, use the wrong flame as a convenience on a certain job, thereby producing a weld unsatisfactory from a metallurgical viewpoint. This cannot happen with the metallic arc, because there is only one type of flame obtainable. When necessary, however, the intensity of its heat may be increased without interrupting the flame, using a remote control such as a rheostat in series with the exciter windings of the generator.

There has been some doubt regarding the successful use of the electric arc for welding light-gage metal, because the arc is likely to penetrate the metal. But if the welding machine is of the proper capacity, the electrode is suited to the job, and correct technique is used, arc welding light-gage metal is no more difficult than welding the heavier gages. Assuming the right machine and electrode are selected, the controlling element is technique, examples of which will be described.

Currents for Welding Stainless

A large amount of stainless steel is used in the construction of corrosion resistant tanks, aircraft engine exhaust manifolds, and dairy equipment. There are various ways to make joints for the corners of such equipment, but probably the simplest and most economical way is to lap weld them. Assuming the material to be between 0.040 and 0.050 in. thick, a 40-amp. current will be satisfactory. The voltage may be set around 25; however, this will vary with the length of the arc on flat work. The rod should be held vertical for a lap weld. On a butt weld, the rod can be held at an angle of 45 deg. for good results. Recommended electrode positions are shown in Figs. 1 and 2.

Fig. 3 shows a tank with lap welded joints. This method of lap welding will be the same on more complicated work, such as exhaust collector manifolds for aircraft. The operator should first examine the work before welding to see if the weld can be made with one rod or that one section can be welded with one rod; furthermore, he should make sure that all the work is within the range of convenient reach, since stopping and starting or extended movements of the body are quite often reflected in the appearance of the weld. This is particularly true of aircraft work where the uniformity of the weld bead may have a definite bearing on the strength of the weld. In addition, this practice makes it possible to weld with ease and speed, and requires the use of a minimum amount of rod, the later being particularly true when the electrode is held directly over the edge of the top piece of metal, as shown in Fig. 2. The saving in rod is effected because part of the bead comes from the parent metal.

Weld Toward Edges

Unless certain definite procedures are followed when welding stainless steel, cracks are liable to develop. They can be eliminated by starting the weld near the center of the work piece and progressing toward the edges as indicated by the arrows in Figs. 4 and 5. Starting a weld on the edge of a part and working toward the center will very often start a crack. This can be be avoided by changing the direction of the weld. Occasionally there may be a small check or pinhole in the weld. To repair this defect, turn the current up to about 100 percent and place a quick spot of weld on the affected area. A little practice and a circular motion of the rod after the arc is struck will produce a satisfactory seal over the pinhole or check. The practice of using a backing strip of metal to prevent burning through when welding exhaust manifolds can be eliminated entirely by using the proper electrode, machine and current.

Reinforcing plates can be welded to exhaust manifolds without danger of warping when the electric arc is used. Heavy line flanges may be welded to the manifold tubing with the same degree of success. The average consumption of electrode on this type of work is 1 ft. of rod for each foot of weld when lap or butt welds are employed. Fillet welds often require more rod; therefore, it is a definite advantage to use lap welds in the design.

It is frequently advisable to check the ductility of welded joints. The specimens can be made by taking two pieces of 18-gage stainless steel about 2 in. wide and 6 in. long, and butt weld them as shown in Fig. 6. The welded sheet can then be cut into strips. After removing all the weld in excess of the metal thickness, polish the weld areas to remove all traces of scratches which might start a crack, and then bend each strip along the weld line with the top side of the weld on the inside of the bend. Bend the strip to an angle of 180 deg. leaving a gap of $\frac{1}{8}$ in. between the fold as shown in Fig. 7.

As an operator improves with practice, he will be able to use larger electrodes and more current on the machine which in turn will cut the cost of material and increase welding speed without sacrificing the quality of the work.

Data and illustrations in this article are from a study submitted to the James F. Lincoln Arc Welding Foundation in its recent $200,000 Industrial Progress Award Program.

TOLERANT TOLERANCES

TOLERANCES are the key to mass production. They show that there is no such thing as an exact dimension and specify the variations that are permissible. But in too many cases the tolerances are not tolerant for economical production. Knowing that the shop can work to "tenths" when necessary there is a great tendency to make tolerances much closer than necessary.

One large airplane company issues leaflets in an Engineering Educational Program that are refreshing and encouraging. They show sketches of parts where the tolerances are too small. They point out that "tight" tolerances require expensive drill jigs and increase production time all along the line. Inspection time is increased, and there is more scrap. This is particularly true for tapped holes.

These leaflets also tell what the correct tolerances should be. If all concerns make it a point to go over the tolerances demanded by their drawings, and loosen them where necessary, it would help the war effort as much as any one thing that could be done.

Buick Forges Aircraft Engine Parts

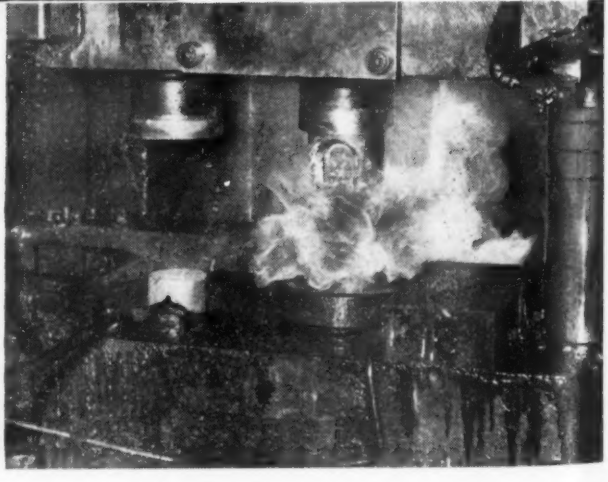
BY ROBERT R. DARNTON, BUICK MOTOR DIVISION, GENERAL MOTORS CORPORATION

Aluminum aircraft pistons are forged from a $3\frac{1}{2} \times 6\frac{5}{8}$-in. billet in a 2,000-ton Ajax press run by two operators, one to insert the billet and move it to the second die pot; the other to remove completed forgings. Two operations are performed in one stroke, yielding a high forging rate

IN ADAPTING their Flint, Mich., forge shop from the production of automobile forgings to the production of aircraft engines, the Buick Motor Division, General Motors Corporation, has developed methods that not only make available existing equipment but reduce the quantity of steel required per forging and turn out parts at a higher rate than by former methods. Buick's practice and equipment have long been based on runs of duplicate forgings, and this has been continued in war production.

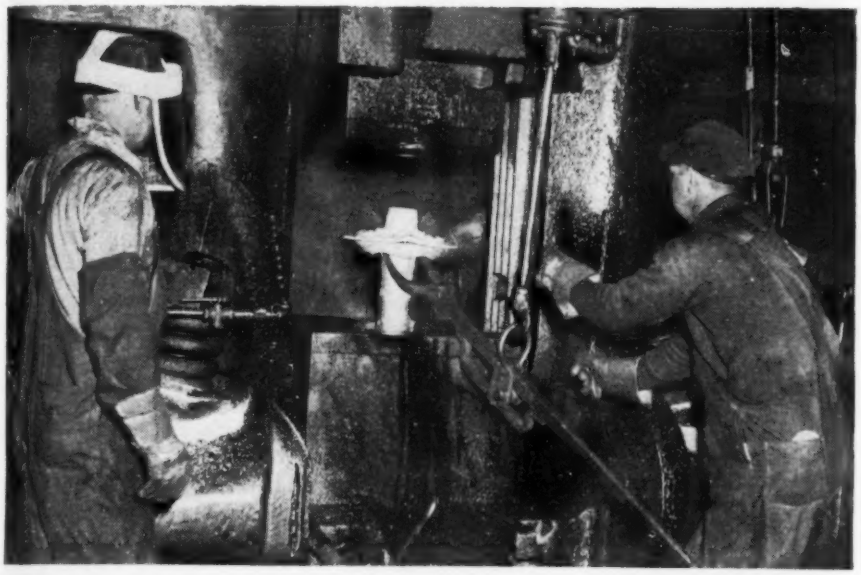
Upsetting machines have been adapted to preparing blanks for propeller shaft forgings with a consequent large saving in the steel required. On the other hand, aluminum pistons, which are frequently upset, are being produced in three concurrent stages on a 2,000-ton Ajax press, thus making use of an available machine with an incidental rise in production rate. The same type of press is also being used to produce reduction gear blanks at a greater rate than is possible with hammer processes.

These practices may be neither unique nor perfect, but they are well adapted to this particular plant. They have resulted in faster and more economical production. Further economies are in process of development and new equipment, particularly heavier and more powerful hammers, will create still further opportunities to speed the turning out of power plants for our fighting aircraft.

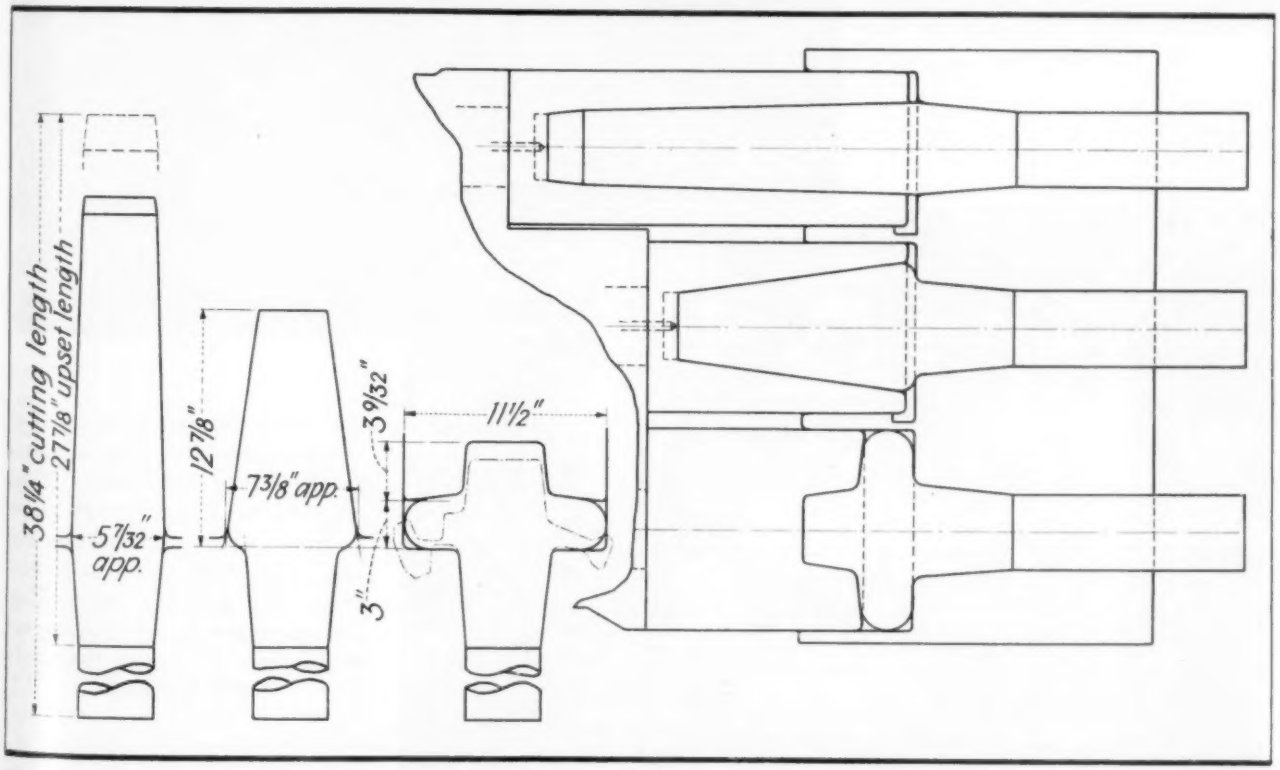


The set-up consists of two die pots, a flat-end ram and two punches mounted on a slide in the head so that both can be lined up over the second cavity. The flat-end ram forms a tapered slug, billet-size at one end, piston-size at the other. This slug is shifted with tongs to the second cavity, where the first punch recesses it, producing a cylindrical piston with internal bosses and partly formed cooling fins. The second punch then moves into line to deepen the recesses between cooling fins and to size the piston

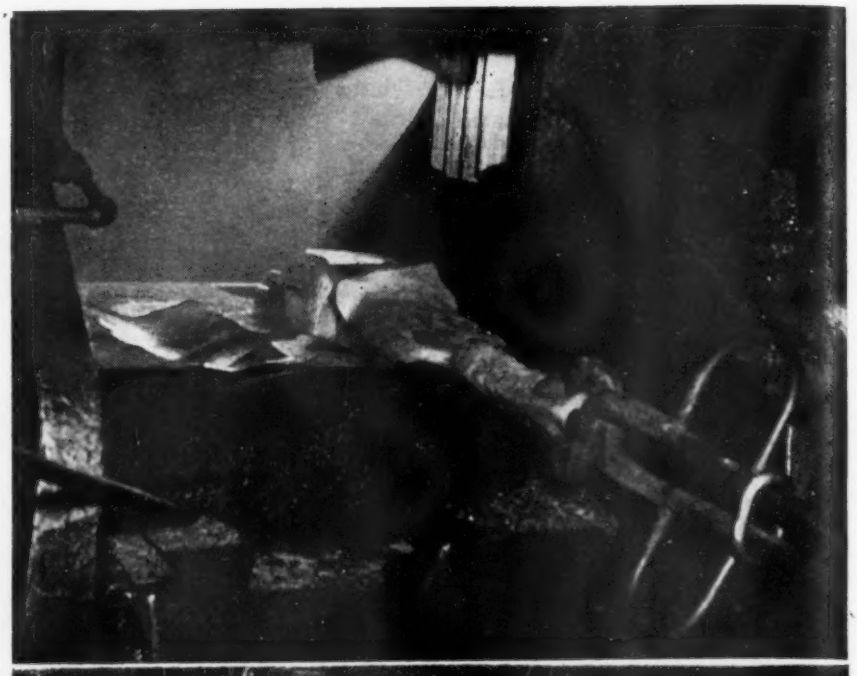
Stages in forging aluminum aircraft piston. The 6⅝-in. billet is heated to 850 F. in a continuous, gas-fired Industrial Heating Company furnace before being inserted in the press. The first stroke produces the tapered slug and two successive punch strokes form the finished piston



Upset propeller shaft blanks are given their final shape in a single drop-forging die. After being forged in a 16,000-lb. hammer, they are carried by trolley to a trimming die for flash removal. Because of the upsetting, little flash is formed, giving an additional saving of material

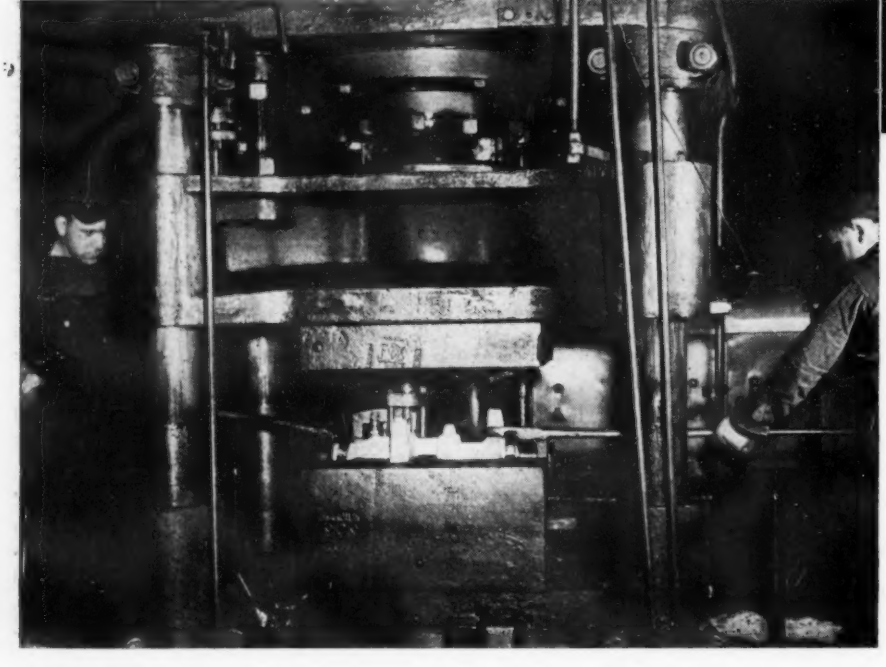


The second largest forging handled in the Buick shop is the propeller shaft. In other plants this has been drawn down to size from large diameter stock. At Buick, a 38½×4 5/16-in. bar is prepared for the hammer by three-stage upsetting which produces a disk 11½-in. wide and 3-in. thick, 3 9/32-in. from one end. This method saves 19 lb. of steel



Aircraft crankshafts are forged from SAE 4340 steel to save nickel. The billets are 20-in. long and 7-in. square with rounded corners. A necked portion at one end provides a tong hold. The billets are fed from a conveyor-type furnace at 2350 F. and carried by overhead track and trolley to a 12,000-lb. hammer where they are blocked to an approximate S-shape. This distributes the metal favorably and produces fairly uniform sections 2 to 3 in. thick

Flash is sheared off in an adjacent Toledo press, and the piece is returned to the forging die without reheating to give it its finished size. The forging is then cooled to 600 F. and drawn to 1300 F. in a pusher-type furnace, after which it is cooled and blasted before going to the centering machine. After being chipped of imperfections, it is ready for the machine shop



The rough forging is chipped of imperfections and then reheated to 2,350 F. before being struck several blows in a 16,000-lb. steam hammer in a single impression die. This gives the crankshaft final shape, but leaves a heavy flash. Care is taken to blow scale out of the die and to swab the cavity with lubricant

Processing Layouts for Metal Cleaning

Metal cleaning should properly be considered in relation to the prior and succeeding operations in a metal-finishing sequence, or in other production processes where cleaning is a factor. From the facts developed by such an analysis it is possible to provide a cleaning method and a cleaning material that will satisfy the particular conditions encountered. Cleaning problems fall into three general classifications:

1. **Cleaning after one operation as a necessary preliminary to a subsequent operation.**
2. **Cleaning before the application of a protective or decorative coating.**
3. **Cleaning as the final operation prior to assembly or inspection.**

BY C. W. SMITH, RESEARCH ENGINEER, ALKALI DIVISION, DETROIT REX PRODUCTS COMPANY

THE CHOICE of cleaning method rests upon the material to be removed from the metal in process and the production requirements. The three methods available are: (1) solvent degreasing, (2) mechanical washing, and (3) alkali-tank cleaning.

Solvent degreasing is employed for removing oils and resins which are soluble in non-inflammable trichlorethylene. This cleaning agent does not chemically affect any metal customarily encountered, and parts emerge from a short-time-cycle cleaning operation in a dry condition.

Mechanical washing is used to clean production metal parts with alkaline solutions, emulsions or oleum spirits, removing loose insoluble material, soluble or emulsifiable oil, in cases where a residual film of the cleaning material or original oil will not be an objectionable factor. Dry-off and blow-off sections are incorporated in cases where moisture or excess spirits must be eliminated. Washers lend themselves well to continuous conveyor systems.

Alkali used in washers produces an oil-free surface, but in a tank application alkali is used where a chemically clean surface free from oil film is desired.

Since the concentration of alkali materials in a mechanical washer is generally low (½ to 1 oz. per gal.) in order to control foaming, and the cleaning time is short (1 to 2 min.), a "water-break" free surface is not usually obtained. Although no oil remains, there is a film present which prevents uniform wetting of water. A surface cleaned in this manner is satisfactory for subsequent heat-treat operations.

If the following step after a preliminary cleaning operation, such as solvent degreasing, mechanical washing, or a preliminary soak tank, is one of plating, all film of oil must be absent, so that the surface may be uniformly wet with water. In an alkali cleaning operation, where a high concentration (4 to 8 oz. per gal.) and a longer period of cleaning (2 to 10 min.), is permitted, it is possible to obtain a "water-break" free surface, which is evidence of the fact that no oil film is present.

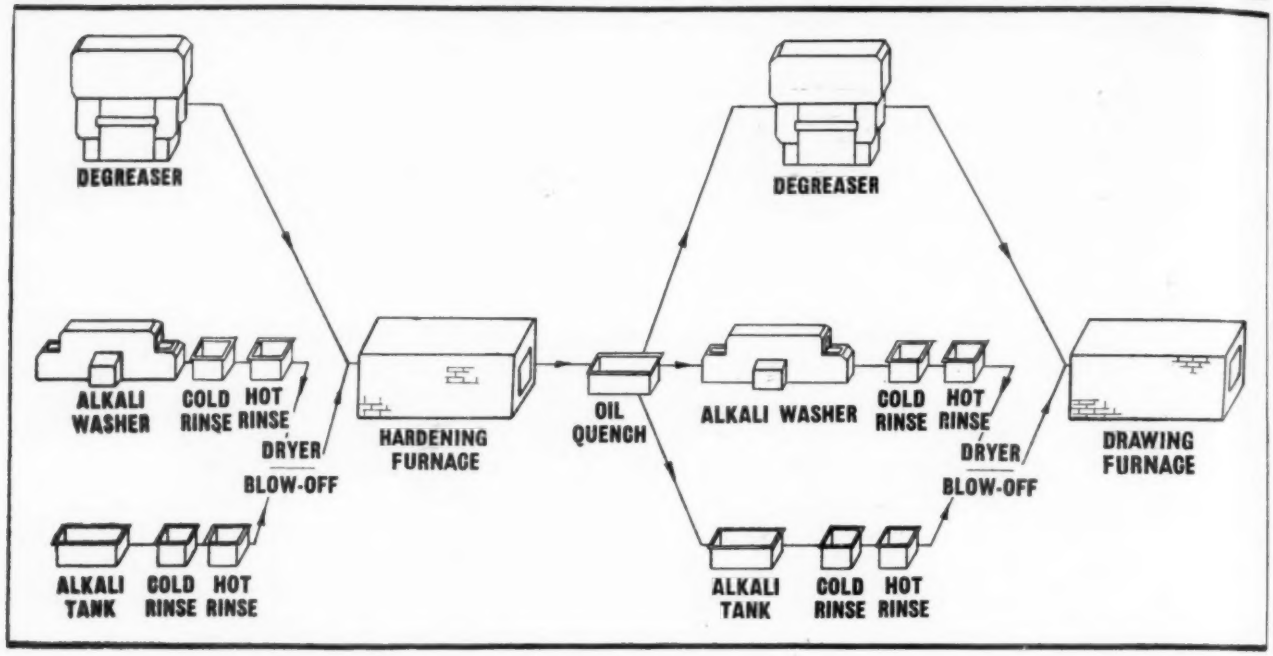
Since alkalies may attack some metals, care must be used in the selection of the proper material for a specific metal. The flexibility possible in alkaline cleaning materials in production is due to the widely varied properties which are possible in compounding.

The considerations to be observed when selecting one of these methods are discussed in relation to six typical cleaning problems:

1. Cleaning steel for heat-treating operations.
2. Cleaning iron, copper and aluminum alloys for annealing and drawing.
3. Cleaning steel for selective carburizing, nitriding and cyaniding.
4. Cleaning aluminum alloys for anodizing, Alzac, Alrok, chromic-acid dipping, and prior to spot welding or mechanical operations.
5. Cleaning steel for painting and phosphate coatings.
6. Cleaning metals for electro-plating, and other electrical processes.

The choice of method for cleaning steel in connection with hardening and drawing is determined by the size, shape and weight of the parts handled and the most effective means of removing the surface con-

CLEANING FOR HARDENING AND DRAWING



taminent. Oil present on the steel is usually of a straight mineral variety applied for protecting against rusting, or remaining from a previous machining, stamping or grinding operation.

Oils containing materials such as sulphur and free carbon react at the high temperatures in the hardening furnace and, therefore, must be completely removed before heat-treating. Sulphurized oils introduce sulphur into the furnace atmosphere, causing soft spots in the steel. Oils and carbon will result in hard spots in steel. Moisture will combine with furnace gases and cause tarnish, and is particularly objectionable in controlled-atmosphere hardening furnaces.

After an oil quench, the quenching oil must be removed before drawing, because carburization may result at the temperature employed. Moisture is also objectionable here and will result in tarnish.

Solvent degreasing effectively removes the straight mineral oil usually encountered, as well as sulphurized oil since trichlorethylene is also a solvent for sulphur. No precaution is necessary to eliminate moisture since parts are dry upon emerging from the degreaser. If insoluble material is present, a high pressure spray of solvent must be used.

Mechanical washing removes insoluble material effectively with alkalies which emulsify mineral oil from surfaces exposed to the direct action of sprays. A hot rinse after a primary rinse in the machine will remove cleaning solution and parts will emerge hot. An additional air blow-off dispels water droplets, and the part will self dry if it has mass sufficient to retain heat and time is allowed for drying before heat-treating. If there is a possibility of moisture being trapped or remaining on the surface, a forced air dryer should be added to insure a completely dry surface before heat-treating. A surface free of oil film is most desirable; therefore, alkali is used in preference to emulsion.

Alkali cleaning in a tank is used where a mechanical washer or degreaser is unwarranted from the standpoint of production or the parts are of such large dimensions that they cannot be satisfactorily handled mechanically. After cleaning, parts must be rinsed and steps taken to dry them thoroughly before heat-treating.

The selection of the particular method of cleaning for a specific application and conditions is largely one of individual preference.

There are several factors which help determine to a large extent the decision on which type of cleaning or what kind of material should be used: (1) Completeness and uniformity of cleaning obtained by a method or material for a specific requirement; (2) cost of installation and operation cost; (3) individual plant limitations —floor space required and method of handling of work.

If each problem is considered by these three factors and the correct analysis is available, the selection of solvent degreasing, mechanical washing or tank cleaning will be much simpler.

Let us take specific examples and the requirements of each to demonstrate how a proper selection can be made:

An example for solvent degreasing is the cleaning of quenching oil from cartridge clips after heat-treat prior to drawing. This requires the parts to be free of oil and dry. They are of such size that they can easily be handled. The cleaning must be done at the proper place in the production sequence without any fire hazard. The facts of the case indicate that solvent degreasing, using a chlorinated, non-inflammable solvent, is an ideal answer to this problem.

A good example of mechanical washing using petroleum spirits is the cleaning of aircraft motors after teardown following test runs. The problem is the removal of dirt, oil and carbon accumulation from aluminum, magnesium and steel motor parts. The problem is the complete removal of oil and dirt without affecting the various metals involved, and prevention of rusting in process of cleaning and reassembly. Large areas of these motors are painted. It is desirable to clean these parts without affecting the painted surfaces. A mechanical washer using two stages of petroleum

spirits, sprayed under pressure and directed at the significant surfaces, followed by a blow-off, is well suited to this problem. Although it might be possible to use an emulsion type material in combination with water, experience has proved that unless such a system is controlled, there is danger of rust occurring due to water in this system. Petroleum spirits have been found to be the most satisfactory standard procedure for use in mechanical washers for this purpose. Adequate fire prevention control must be installed on such machines, so as to meet fire prevention regulations in industrial plants.

An example of an alkali cleaning tank operation is one where forged aircraft motor crankshafts are being cleaned after preliminary machining prior to plating with copper for the purpose of "stop-off" in selective carburizing. The parts must be clean of all oil and shop dirt, and surfacce must be wet with a continuous film of water.

A primary cleaning operation in a solvent degreaser, alkali washer, or soak alkali tank may be found valuable. The complete cleaning job or the final step should be an alkali immersion-tank cleaning operation. The parts in this case are of considerable size and weight and are handled on the same hooks as will be used for the subsequent plating operation.

In summarizing the factors of temperature of parts, water wet or water-repellent surfaces, fire hazard, ease of handling, and preferential solvency for oils, without affecting organic coatings or plastic parts of the article, the desirability of one type of cleaning in preference to another often appears very clearly defined.

The cleaning operation after oil quenching and before drawing is similar in equipment requirements to the layout needed before hardening. The oil used in quenching is usually a straight mineral oil of one or more grades. Precision work requires that all oil and moisture be removed from parts before drawing.

Annealing operations are frequently required between deep-drawing operations when making steel, copper and aluminum alloy parts by presswork. Any material present on the workpiece is objectionable if it will react during the annealing operation and thereby establish a need for extensive pickling. Likewise, a reaction product is undesirable if it hampers the drawing operation if a pickling operation is not provided. The cleaning of different alloys before annealing presents individualized problems.

Controlled-atmosphere annealing furnaces requires complete cleaning and drying of parts in order to produce scale-free, bright work. Their purpose is to eliminate pickling after annealing.

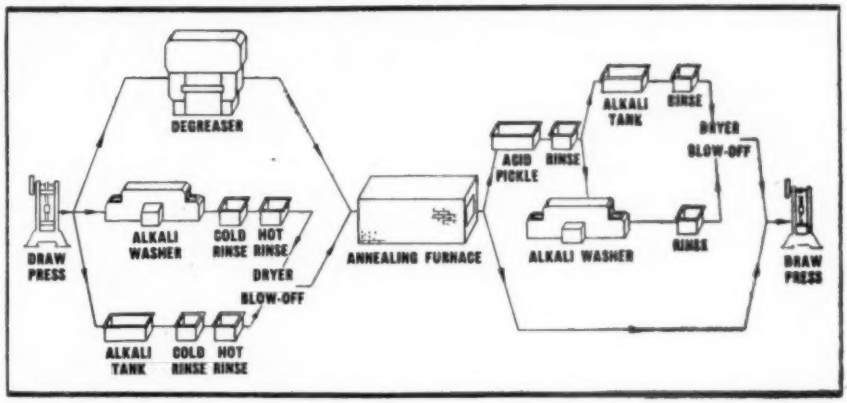
The choice of the cleaning method is dependent upon the nature of the material on the metal surface, the metal involved, and the most satisfactory means of handling the production.

Drawing compounds used on steel range from staright mineral oil and soluble oils containing soap, to those containing sulphur or graphite. The pigmented compounds containing lime, graphite and white lead present the greatest problems, graphite and lead compounds being the worst because they are chemically unreactive to any of the cleaning materials used. Hand scrubbing or high pressure sprays are usually necessary to remove such materials.

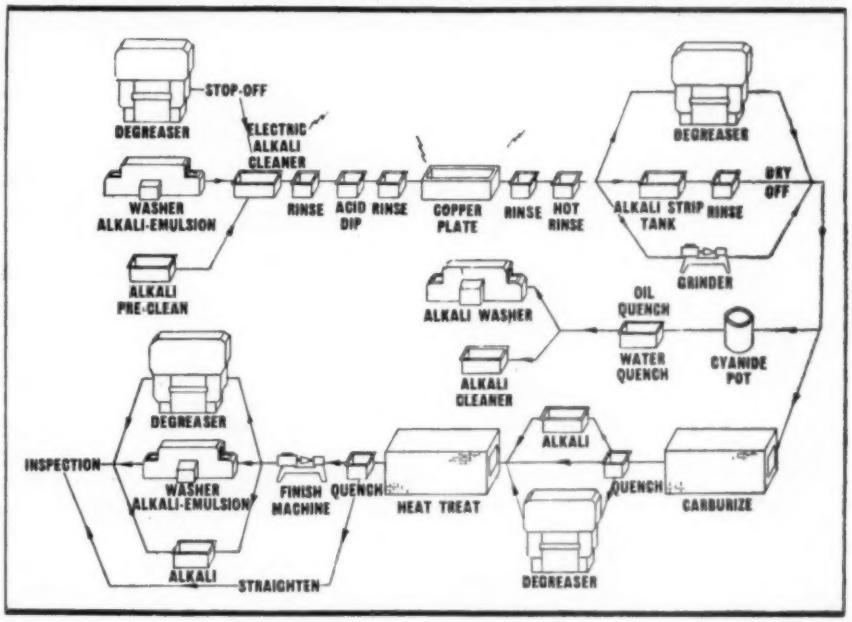
Compounds used on brass are usually of the soluble-oil type containing soap and sometimes sulphur. Sulphur is particularly annoying because it reacts with copper alloys to form a black sulphide of copper under certain conditions.

Aluminum alloys are usually drawn or formed with straight mineral oils, because: (1) aluminum reacts with water and soap to form metal soaps which are difficult to remove, and (2) aluminum does not require high-pressure lubricants in forming. Aluminum alloys are cleaned after drawing or forming and prior to annealing to pre-

CLEANING OF IRON, COPPER AND ALUMINUM ALLOYS FOR ANNEALING AND FURTHER DRAW



CLEANING OF STEEL FOR SELECTIVE CARBURIZING OR CYANIDING



vent carbon; they are generally not pickled after annealing.

Brass and steel usually require several draws before the part is completely formed. Each draw normally requires an annealing operation, and also a pickling operation unless a controlled-atmosphere annealing furnace is employed. Pickling of iron scale is expensive and often leaves a pitted uneven surface. Brass is more easily pickled and the scale is usually light. After pickling, both metals must be thoroughly neutralized, or washed, to eliminate any trace of acid and to prepare the surface for reapplication of drawing compound.

Solvent degreasing is used on oils and drawing compounds which are soluble in trichlorethylene: parts are finished in a dry state before controlled-atmosphere annealing. Solvent degreasing is particularly adapted to cleaning of formed parts where oil is retained in inaccessible areas, since sprays can be used.

The soluble oil compounds sometimes are washed only with hot water, but a much better job of cleaning can be obtained by using alkali or emulsion combinations which will produce a clean surface and reduce scale formation in annealing. Pigmented compounds are effectively washed from surfaces where sprays have access. The neutralizing or washing operations after pickling and before the next draw are done largely with washers. The adaptability of washers to straight-line production is a factor in their selection for production work.

Alkali-tank cleaning is used on all types of metals and is effective on soluble or mineral oils, but is not particularly good for removing pigmented compounds. Alkali cleaning is used in cases where a wide variation of parts are being run through a single production line and special equipment is unwarranted. Due to chemical reaction of alkalies with aluminum and brass, special compounds are supplied.

Applications of cleaning in connection with selective carburizing, nitriding and cyaniding are more extensive than for annealing. Oil present on parts is usually of a straight mineral variety: often a sulphurized oil has been employed for preceding machining operations. A preliminary cleaning step removes large quantities of oil and chips. Solvent degreasing, mechanical washers using emulsion or alkali materials and alkali cleaning tanks are employed for this operation.

Preparation of the steel for "stop-off" plating with copper, tin or nickel is essentially the same as for any electroplating process. Areas not wished plated may be coated with a chemically resistant non-conductive layer of wax or lacquer. These coated surfaces are later stripped and carburized. Degreasing of parts before application of the insulating material will produce a dry surface free of oil ready for coating. After the wax or lacquer is dry or baked in an oven, the parts are racked for plating. Cleaning for this is done in an electric cleaner tank using an alkali cleaner. Care must be exercised to avoid injury of the insulating stop-off material in the cleaning tank.

The majority of parts to be selectively hardened are first plated, then the surfaces are ground or machined to remove the plate on surfaces to be hardened. The choice of the cleaning method is similar to other cleaning problems in respect to consideration of the best method of removal of oil and the requirements of production.

Grinding off protective plating eliminates the removal operation of a wax lacquer after plating. If wax is to be removed a degreaser is best; if lacquer is to be stripped an alkali or solvent type cleaner is used.

Copper is plated for protection of steel surfaces from carburizing or cyaniding. A thickness of 0.0005 in. to 0.0015 in. of copper is deposited to give complete protection. Tin or nickel is plated to protect steel surfaces from nitriding. The thickness of tin is usually not more than 0.0001 in. because heavy deposits of tin will melt and flow over areas to be nitrided.

Oil and moisture must be eliminated from the work before going into the furnace or cyanide pot. A gas carburizing furnace is most commonly used for large scale operations. Carbon monoxide and carbon dioxide supply the carbon for the carburizing atmosphere. An oil containing sulphur will burn off and may form carbon disulfide which takes carbon from the steel; the result is decarburization.

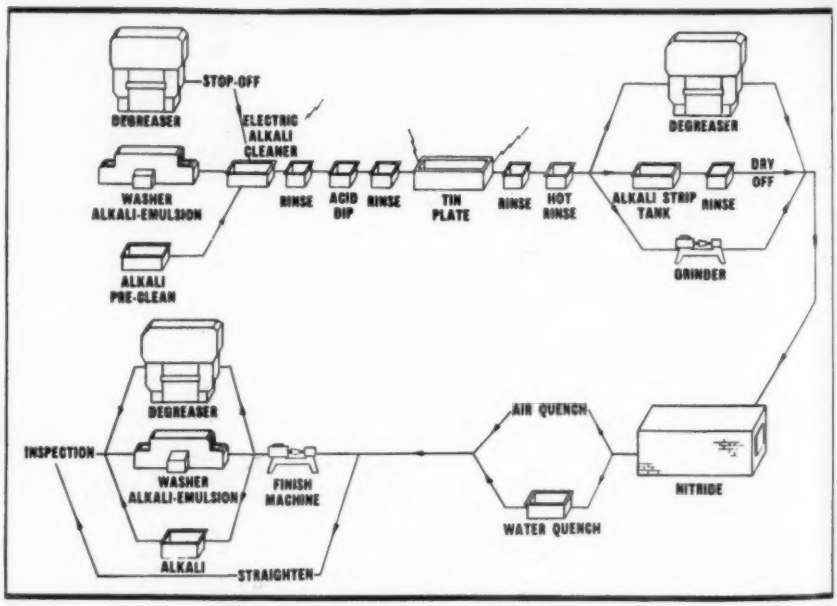
After carburizing, parts may be quenched in oil directly, or allowed to cool and then heat-treated and quenched. After quenching, frequently parts are stress relieved. The oil from the carburizing quench is removed in a degreaser. Parts must be finish-machined or straightened, since carburizing warps the steel to some degree. If they are finished machined, another cleaning operation is used before final inspection.

Cyanided parts are quenched in water or oil depending on the properties desired. Alkali is always used to clean after an oil quench in this process, since cyanide should not be introduced into a degreaser.

The handling of the cleaning problem in nitriding is the same as for carburizing. Usually no quench is used after nitriding and parts will go directly to straightening or final grinding or machining. Oil from the machine operations is removed before final inspection. Emulsion cleaners used in mechanical washers perform a satisfactory job in removing oil before final inspection and leave a film of oil which is not objectionable but furnishes a moisture-repellent surface to resist rusting.

(To be continued in an early number)

CLEANING OF STEEL FOR SELECTIVE NITRIDING



Inspection Cut From Two Days to One Hour

Angle plates fitted to a cast-iron base carry indicators that check the diameter and location of 18 holes in a 400-lb. casting. The fixture is operated by a semi-skilled inspector

BY HENRY BERNADT,
GENERAL ELECTRIC COMPANY

Fixture with dial indicators checks location and diameter of ball-bearing fits and the alignment of finished surfaces on large and intricate castings

INSPECTION of a 400-lb. casting, machined with 54 holes ranging from 1 to 5½ in. diameter, required two days. Such inspection included checking the location of finished surfaces and the diameter of the holes, which were for ball-bearing fits on gear shafts. Several of the holes are located inside the casting, making their inspection extremely difficult. Moreover, it involved a certain amount of calculation, which was susceptible to error. The large number of castings on order made two-day inspection prohibitive.

The illustrated fixture was built for the job, and with it a semi-skilled inspector can check the casting completely in one hour. The possibility of error is negligible, since all surface locations and hole diameters are checked with indicators and the need for calculation is eliminated.

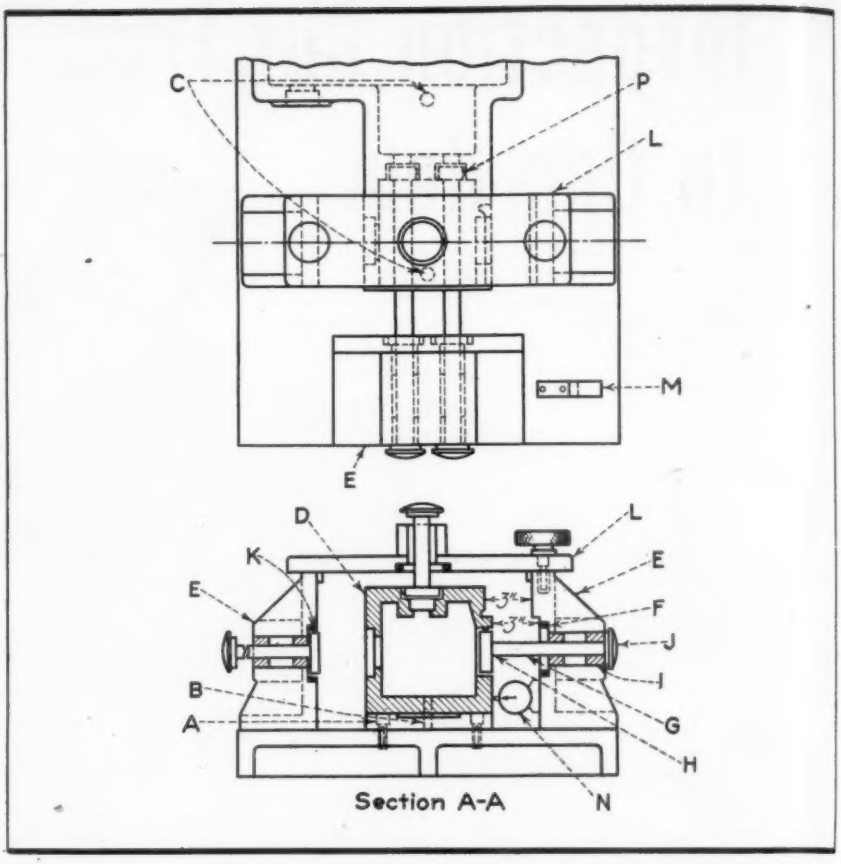
The cast-iron base of the fixture is 36 in. wide, 56 in. long, and 9 in. high. After rough machining it was normalized, finish machined, drilled and finally scraped to a flat surface. Two parallel blocks *A* each with a locating pin *B* are fastened to the base. Two holes *C* in the bottom of casting *D* are used for locating all machining and checking operations. Angle plates *E* are bolted and doweled to the base 3 in. away from the finished surfaces of the casting. Holes are bored in angle plates *E* at locations correspond-

ing to the holes drilled and reamed in the casting.

Each indicator on the fixture operates on the same principle: Pressed into the fixture at each hole location is a hardened and ground ring *F*, the inside diameter of which is the same as that of the hole to be checked. Plunger *G*, fitted with circular head *H*, slides in bushings *I* and carries indicator *J*. Inside head *H* is a ¼-in. pin *K* that actuates the indicator dial.

Before taking readings, the plunger assembly is pulled back into ring *F* and the indicator set at zero. Then the plunger is pushed into the hole and readings are taken at four equally spaced points. If the indicator reads zero at all four positions, the location and diameter of the hole is accurate; otherwise, the indicator will show how much the hole is off and in what direction.

Bridge *L* for checking top holes in the casting is attached to the angle plates after the casting is placed in the fixture. Z-shaped gage *M* is fastened to the base for setting indicator *N* to 3 in., the distance the casting sets from the angle plates. This indicator is fastened to a hardened base and the operator slides it along the face of the angle plate with the plunger against the work. The indicator will reveal whether or not the casting is square with the angle plates. Holes *P* deep in the casting are checked with indicators attached to long plungers.



Rings pressed into the angle plates are the exact diameter of holes required in the casting. When the gaging head on each indicator is set in its ring, the indicator dial is set at zero. If the hole in the casting is accurate, the dial reading will not change when the gaging head is pushed into it

IT'S STILL A MATTER OF MEN

IN THIS machine-made world, the great majority of shop processes have been taken out of the hands of men and entrusted to mechanical devices. Automatic machine tools make the parts, conveyor systems carry them from place to place, and complicated gages inspect them. Almost nothing is left to us fallible humans.

Yet for ultimate accuracy, the system reduces to the man. At Warner & Swasey, Emil Seitz, a veteran of 35 year's service, uses a crude-looking lapping arrangement, powered by a spring-suspended, portable drill motor, to finish lap the lockbolt sleeves in turret lathe saddles. Since any play between the lockbolt and its sleeve is multiplied by the turret and the extended tools, the close, responsive control of human intelligence is necessary to achieve the fine balance between snugness of fit and freedom to move. No machine refinement will help. Hence, the experienced man.

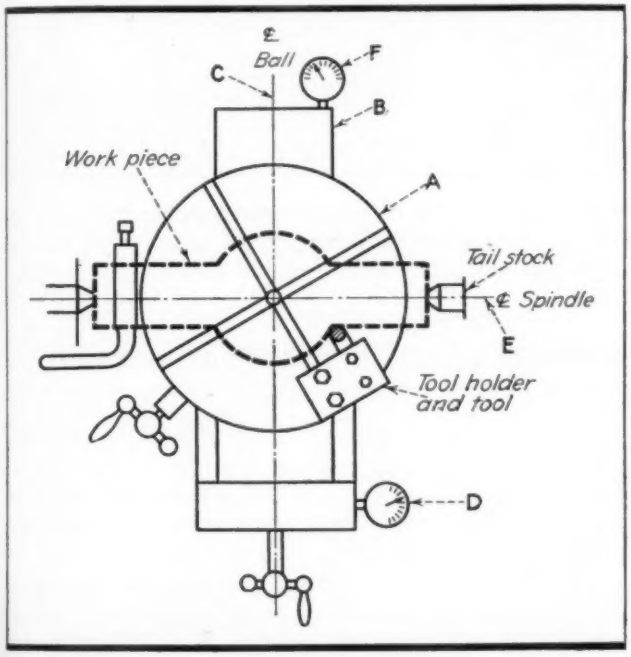
IDEAS FROM PRACTICAL MEN

Lathe Equipped to Machine Spheres

BY E. J. HEYMAN

Machining spherical balls to close tolerances always offers a problem. This is especially true when size and conditions are such that form milling cutters, turret lathe form tools, grinding wheels, or taper attachments cannot be utilized. Using machine tools and accessories found in almost any shop, the following is a method whereby spherical contours can be machined on a production basis.

The compound rest and compound rest base are removed from an engine lathe, and a standard rotary table *A* mounted on cross-slide *B*. A 9 in. diameter rotary table will



A rotary table replaces the compound rest in this lathe set-up for turning spherical surfaces

turn spheres up to 4 in. diameter. If the rotary table is equipped with a worm or screw, only a simple toolholder and tool is required.

The cross-slide is placed so that transverse center line *C* on the rotary table coincides with the desired center line of the ball. The cross-slide is either locked in that position, or an indicator *D* or stop is clamped to the bed of the lathe to indicate the coincidence of the two center lines.

Longitudinal center line *E* should be placed directly under the spindle center line and an indicator *F* or stop clamped to the lathe bed so that the cross-slide can be stopped in that position. The toolholder and tool are then adjusted to the desired radius of the ball. A round-nose tool should be used for machining the spherical contour.

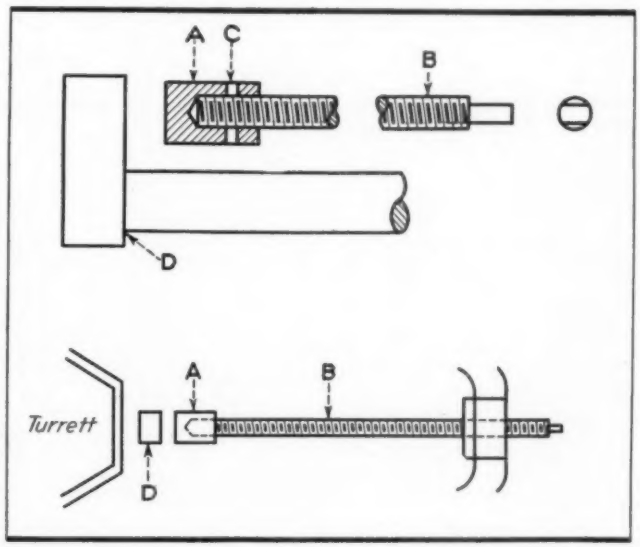
For the first roughing cut or cuts, the cross-slide is fed into the work to the desired depth, rotating the table in an arc while making the cut. In a like manner successive cuts are taken until the back of the cross-slide strikes indicator *F* or the stop, at which time the finish cut is made and the spherical surface completed. The position of the cross-slide for the finish cut is shown in the drawing. At this position, both indicators should read zero.

On a lathe on which the direction of spindle rotation can be reversed, another tool can be placed on the back of the rotary table. Forming or facing operations on other parts of the work piece can then be made either by rotating the table, moving the cross-slide, or both. Then for turning the sphere, the cross-slide is brought to its longitudinal stop again. When using a second tool, care should be taken so that it will not interfere when the table is rotated for the spherical cuts.

Repairs to Worn Turret Stops

BY E. J. BREEDING

The turret stop mechanisms on some of the older type turret lathes become worn after long use, making it difficult to position the turret accurately. This is particularly true when the stop screw becomes slightly bent or worn round at the point of contact with the stop block. This condition may be remedied with little cost on some lathes by the addition of a steel block *A* on the end of each stop screw *B*, the block having a larger contact area than the original screw. Block *A* is made from hardened bar stock and drilled and tapped to fit the stop screw. The assembly is then drilled for pin *C*, which eliminates play between the two members. Should stop block *D* be worn badly, it can be milled to a flat parallel surface.



When screws on turret lathe stops become worn, pin an auxiliary block to the screw to increase the contact area between the screw and stop block

Simplifies Hand Tapping of Nuts

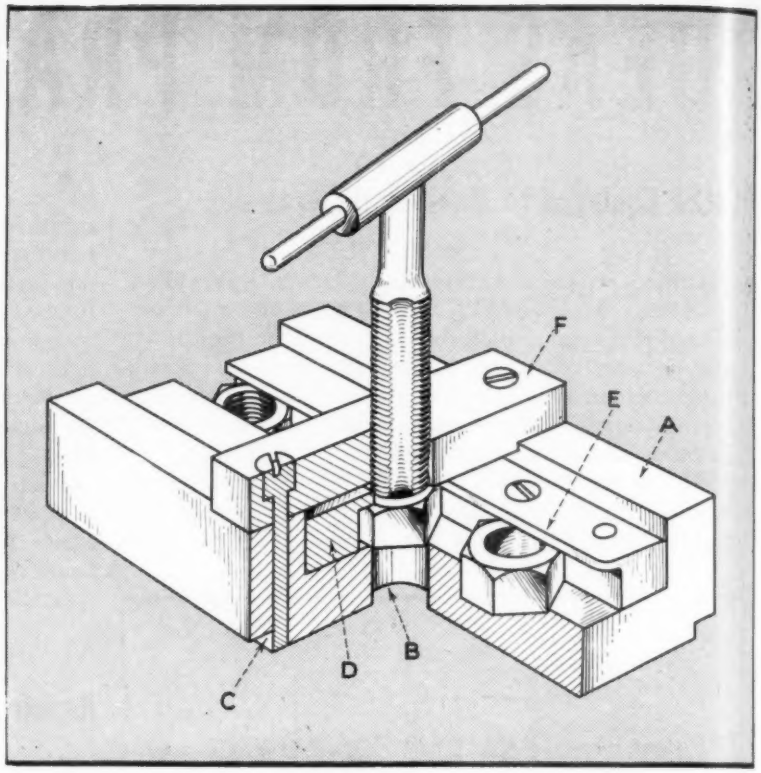
BY ALEX GEORGE

When running fine threads in small nuts, the illustrated fixture will maintain alignment of the tap, assure easy starting of the tap, produce threads at right angles to the axis of the nut, and minimize tap breakage. Body *A* of the fixture is made from machine steel with a slot milled through its length. Hole *B* is drilled at the center of the base and is about $\frac{1}{8}$ in. larger than the tap for tap clearance and chip disposal. Grooves *C* are milled along the edges of the base so the fixture can be held in a vise. The sides of the slots must be square with the adjacent sides of base *A*.

Two guides *D* are assembled to the base with screws and dowels, the space between them being a free fit for distance *X* across the flats of the nuts. These guides prevent the nuts from turning while being tapped, while ledges *E* prevent them from lifting while the tap is being removed. Holder *F*, fitted into slots on the fixture body with capscrews and located centrally above hole *B*, is drilled and tapped with threads of the same pitch required in the nuts. Several nuts are loaded in the fixture and are pushed along as each succeeding nut is tapped. The tap is held square with the nut, since it first screwed into holder *F*, and further turning of the tap starts the threads in the nut with the assurance that they will be straight and accurate.

All parts of the fixture are machined accurately, while the holder *F* and the slots in the top of body for holder *F* are ground for a close fit to maintain alignment between the tap and the nut. The hole in holder *F* is drilled and tapped in a jig borer so that it will be aligned with the hole in the base and so that the tap when in use will be perpendicular to holder *F*.

Fixtures for a variety of nut sizes have been built in our shop. Rejects due to bad threads have been eliminated, and taps are seldom broken.



Several nuts are loaded in this fixture for hand tapping. The tap is held in perpendicular alignment to the nut by screwing it into a holder centrally located on the fixture

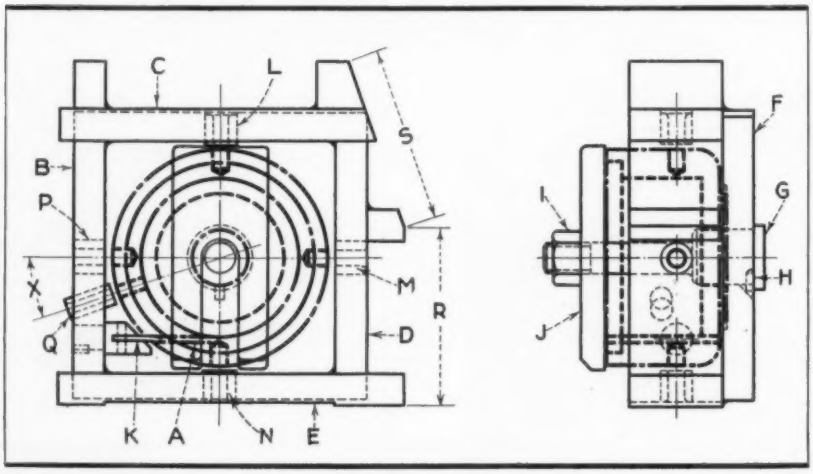
Machined Casting Drilled in Five-Way Jig

BY F. SCRIBER

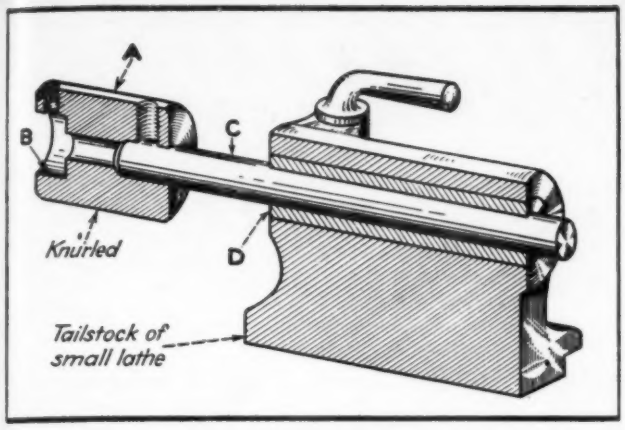
The pot casting shown by heavy dashed lines in the drawing is 4 in. in diameter and required the drilling of five holes in the outer wall. Before drilling, the casting is machined all over, and slot *A* is milled through the outer and lower wall to the center line.

The drill jig is of welded plate construction, consisting of four side plates *B, C, D* and *E*, and base plate *F* against which the casting is located. Stud *G* is a press fit in the center of plate *F*. Pin *H* prevents the stud from turning when the casting is pulled down by nut *I* and clamp *J*. This clamp is slotted from one end so that it can be slid from under the nut when removing the casting. The hole in the lower wall of the casting is large enough to pass over the nut.

The casting is located in the jig by finger *K* which enters milled slot *A*. Once the casting is clamped, the jig can be handled freely without disturbing the work. The five holes can then be drilled by guiding the drills through bushings *L, M, N, P* and *Q* while resting the jig on the feet directly opposite each hole. When drilling holes in line with bushings *P* and *Q*, care must be exercised to see that the jig rests square on that portion of the feet indicated by *R* and *S*.



This jig can be turned alternately to five positions for drilling holes in the outer wall of a machined pot casting



This die holder can be held in the hand while threading small parts. When the die hits the screw shoulder, it will revolve, preventing damage either to the thread or die

Threads Shoulder Screws Safely

BY WALTER KARPUSIEWICZ

The die holder shown in the drawing was made to prevent breakage of small dies when running threads against a shoulder. Knurled holder *A* has a recess *B* to fit the die, and is made small enough to be held in the palm of the hand. The die and shaft *C* are held in the holder by setscrews, while shaft *C* is a loose fit in tailstock bushing *D*, which is specially built for this tool.

When running the threads, holder *A* is gripped firmly by the operator's hand until the die hits the screw shoulder, whereupon the holder is released and permitted to revolve. This action prevents the thread die from chipping.

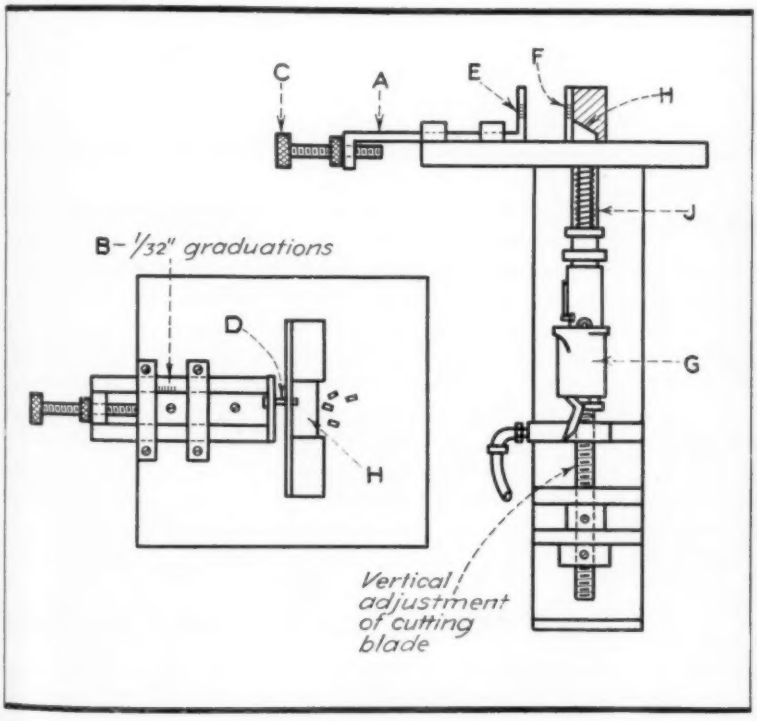
Pneumatic Cutter Shears 2,500 Rivets a Day

BY S. D. GARDNER

Engineering developments in the design of an airplane frequently make it necessary to substitute a different length rivet for the one used formerly. Fortunately, the number of rivet head types and diameters is not too large for a surplus of the longest shanks of all standard types to be carried in stock. This reduces the problem to a matter of cutting to the special lengths a sufficient quantity of the head type and diameter required to relieve any emergency.

A sizing disk with a hand-operated blade was originally used for this purpose at the Nashville Division of the Consolidated Vultee Aircraft Corporation. It has been replaced by the illustrated unit consisting of a cutting blade operated vertically by an air cylinder from a standard squeeze riveter. Operation is controlled by a foot pedal at the base of the machine. Plates that guide and hold the rivets have holes corresponding to the various rivet diameters, and the cutting blade, which slides against the back of the cutting plate, is wide enough to cover the holes drilled in staggered locations in the plate.

When in operation, guide plate *A* is first set for the length of rivet required, using graduations on scale *B* and stop screw *C*. An over-length rivet *D* is inserted in guide and ejector plate *E*, using a hole corresponding to the rivet diameter. As plate *E* is pushed forward against the stop, the rivet is guided into a hole in cutting plate *F*. When power is applied to air cylinder *G* by depressing a foot lever, cutting blade *H* ascends and shears the rivet. Compression springs *J* return the blade to starting position. One operator can shear from 2,000 to 2,500 rivets each day with this device without exerting himself.



The guide plate on this machine is set against a positive stop so that rivets can be sheared to length in minimum time. The cutting blade is operated pneumatically by depressing a foot pedal. Production is 2,500 rivets every 8 hours

War Winning SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.

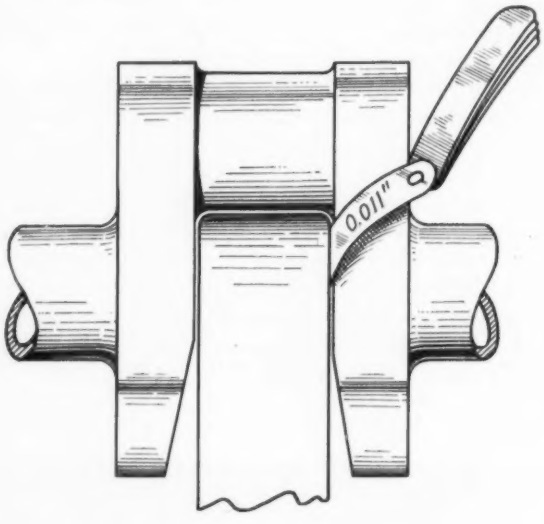


FIG. 1

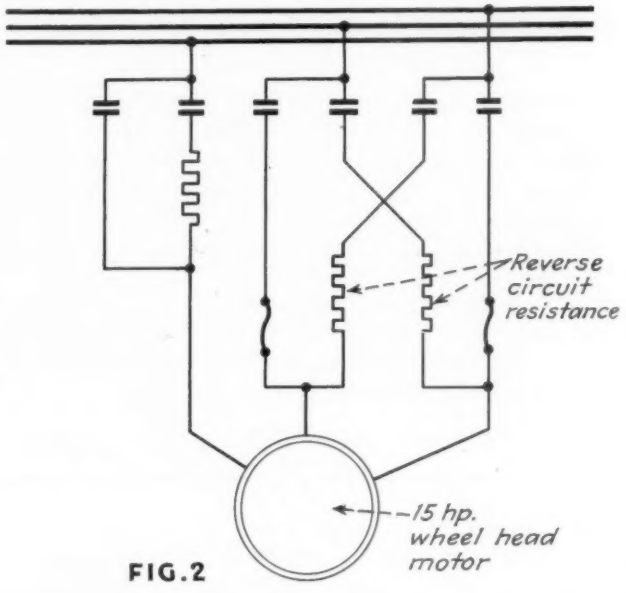


FIG. 2

Large Grinding Wheel Stopped in 12 Seconds

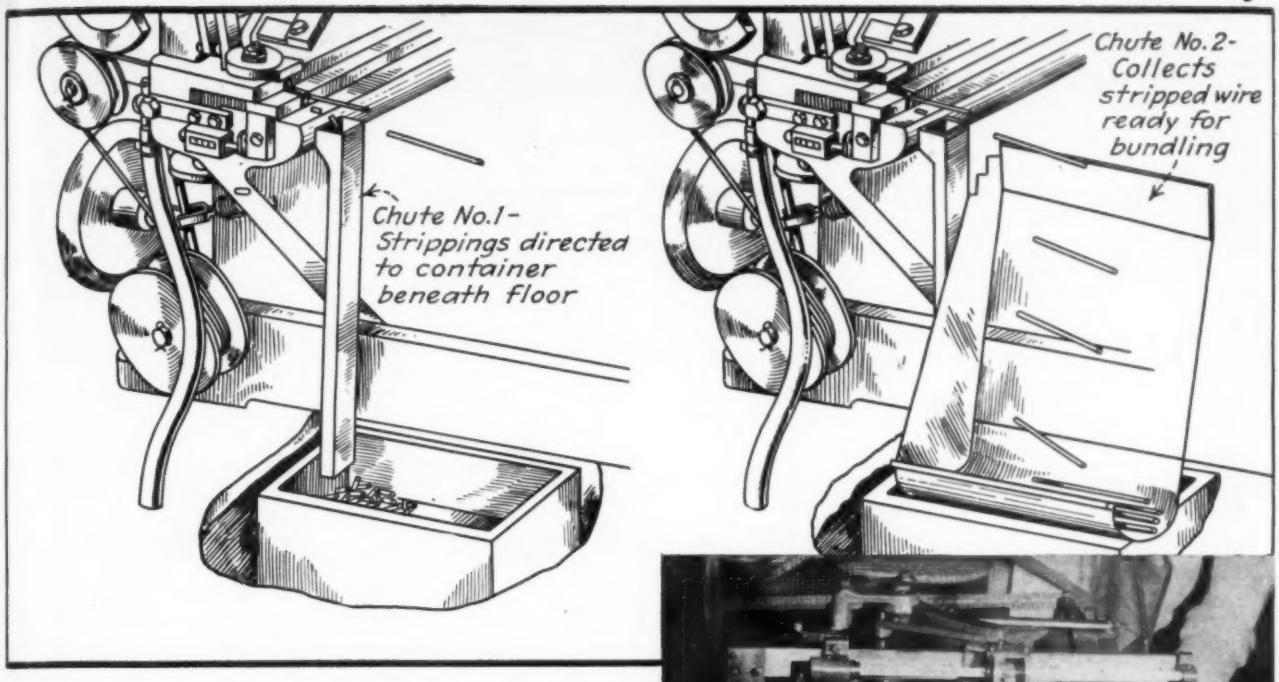
Crankshaft bearing and crankpins of the Rolls-Royce engine are finish ground with large grinding wheels of 36 and 42-in. diameter, and a width sufficient to cover the entire bearing surface. Their great weight keeps them in rotation for 3 min. after power is shut off, which materially increases production time.

Between the side faces of the wheel and the throws of the shaft there is a clearance of only 0.011 in., which requires separate alignment on each bearing and pin. Such alignment must be made with shims and with the wheel stopped, as shown in Fig. 1. Since there are seven main bearings and six crankpins on each shaft, the wheel has to be stopped twelve times during this one operation, resulting in a dead time loss of 36 min. per shaft. Multiplying this time loss per shaft by the number of shafts to be produced daily, it can be understood why steps were taken to provide a brake which would bring the grinding wheels to a stop in the minimum possible time.

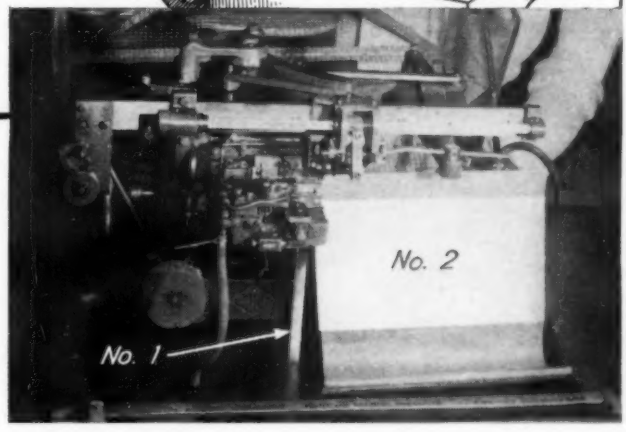
Friction brakes were tried and proved impractical due to the short life of linings and the necessity of constant adjustment to produce sufficient smoothness of action and prevent breakage. The problem was solved by introducing a reverse current into the motor with enough resistance added to reduce the full power until a satisfactory result could be obtained. Through testing several arrangements, a reverse force was introduced to stop rotation in 12 sec. The wiring diagram of the resistance plug braking adopted is shown in Fig. 2. This braking principle has been applied to 15 machines, and has resulted in a saving of approximately $11,000 annually. *Suggested by Harry E. Peters, Aircraft Engine Division, Packard Motor Car Company.*

Wire Stripper Equipped With Collecting Chutes

Insulated wire is reclaimed by Artos machines which strip the insulation from the wire and if desired cut the wire into predetermined lengths. It is customary to drop the strippings and cut wire on a table and sort them by hand. The latter practice has been eliminated by directing the strip-



pings into a chute that deposits them into a container below the floor. A second chute resting on the floor adjacent to the machine collects the stripped wire lengths in an orderly manner ready for bundling. Based on reclaiming 1,000,000 sets of wire annually, comprising 20,000,000 pieces, it is estimated that $1,000 will be saved by the addition of these chutes to seven stripping machines. Savings to date justify this estimate. *Suggested by Arthur Brown and Gladys Wisley, RCA Manufacturing Company.*

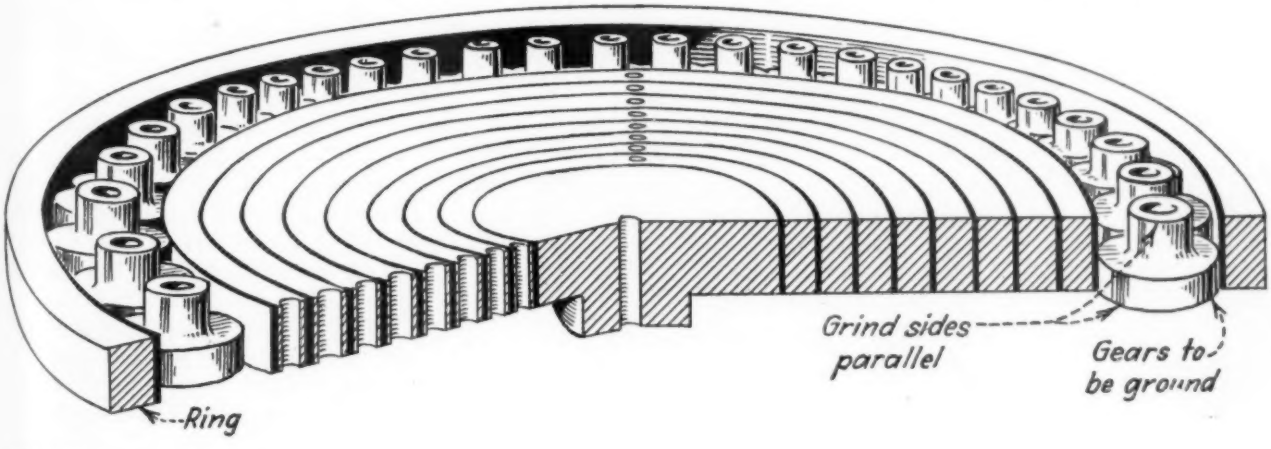


Laminated Chuck Used for Grinding Gears

A number of small gear blanks can be surface ground at one time with the aid of Universal laminated rings held on a magnetic chuck. This device is comprised of eleven rings with a sliding fit between them. Each consists of a steel outer ring to which is press fitted an inner brass ring. The alternate brass and steel ring assembly coordinates the poles of the magnetic chuck when it is set-up on the grinder and the current is turned on.

The gear blanks, that require the sides of the hubs to be ground parallel with opposite sides of the gears, are inserted in the space left by removing one or a number of the eleven rings. The flat side of each gear sets flush on the laminated chuck. The gear blanks are set in the openings so that they touch each other and form a complete circle. One or more complete rings of blanks may be inserted to fill the face of the laminated chuck. Only one circle of gears is shown to illustrate this principle.

To date, seven different sets of gear blanks have been ground with this chuck on a Blanchard No. 11 surface grinder. The set-up replaced a special fixture which could hold but two gears. Actual time study has revealed that a given number of gears can be surface ground in one-sixth the time formerly required. *Suggested by Raleigh C. Ormarod, Emerson Electric and Manufacturing Company.*

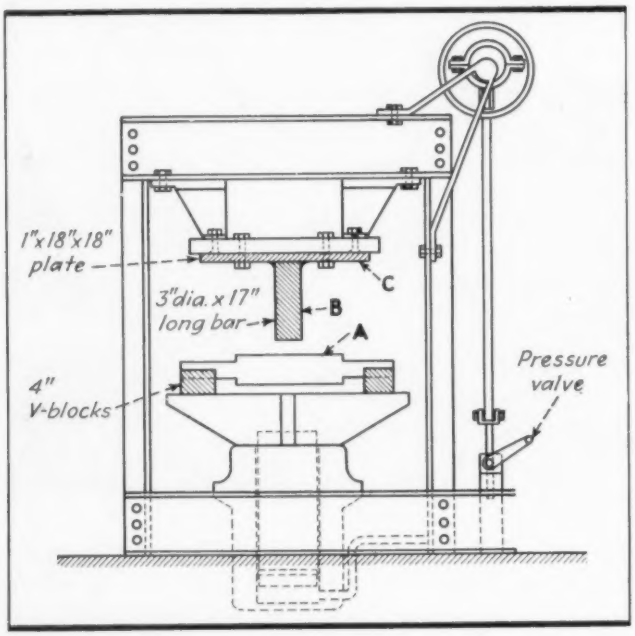


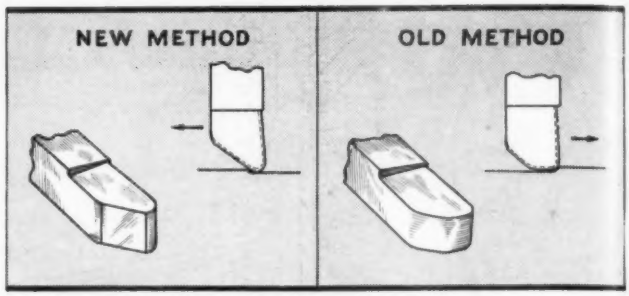
★ WAR-WINNING SUGGESTIONS ★

Straightening Press Operated by One Man

Shaft *A* shown in the drawing is supported by V-blocks on the press bed for straightening after heat-treatment. This work was done formerly by two men, one to hold a round bar between the shaft and press ram, and one to manipulate the pressure valve that controls the hydraulic pump which operates the press.

In order to release one man to operate a second straightening press, necessitated because considerable skill is required to straighten the shafts and reliance cannot be placed in newly trained help, bar *B* was welded to a flat plate for bolting to the press ram. This assembly was aligned with bar *B* perpendicular to shaft *A*. With the bar thus mounted permanently to the ram, one man can operate the press. *Suggested by Frank A. Reynders, Automatic Transportation Company.*





Tool Feed Reversed for Faster Cutting

In facing the scavenger pump driving gear of the Rolls-Royce engine, the tool was fed left to right as shown in the drawing. The tool was reground so it could be fed from right to left. This resulted in a knifing or shaving action on the metal instead of the former gouging action. Less heat is generated at the tip of the new tool, thus permitting a faster feed. An improvement in surface finish was also obtained. *Suggested by David Fabert, Aircraft Engine Division, Packard Motor Car Company.*

Single Templet Bends Ship Tunnel Frames

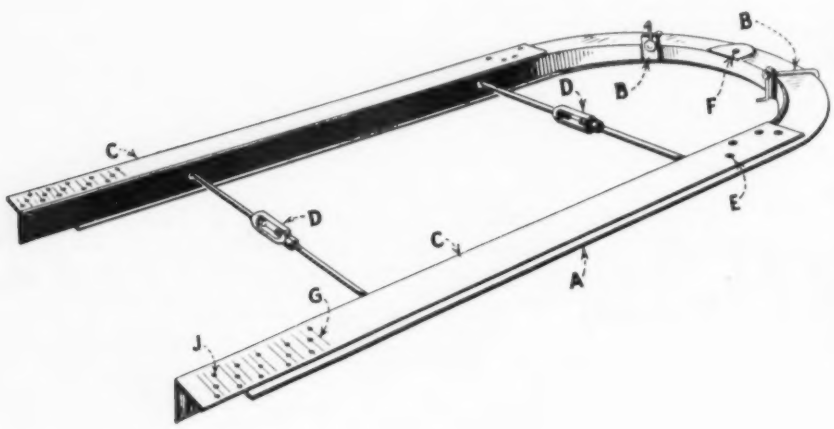
Frame members for propeller shaft tunnels on EC-2 cargo ships are made of 4×6-in. angle iron which is heated and first bent approximately to the cross-sectional shape of the tunnel. They must then be bent to accurate shape, the legs be cut to precise length, and rivet holes punched in definite locations. All these are accomplished with the illustrated templet.

Legs *A* of the tunnel frames are bent further than necessary and while still hot the templet is placed within the frame. The arch of the frame is then pulled tight against the templet by clamps *B*. Templet angle irons *C* are pushed outward against stops by turnbuckles *D*, which brings the legs of the tunnel frame parallel. Rivet holes *E* can then be punched.

The center of the frame arch must be located to facilitate assembly. This center is marked with the aid of plate *F* welded to the templet and through which a hole is drilled for inserting a center punch.

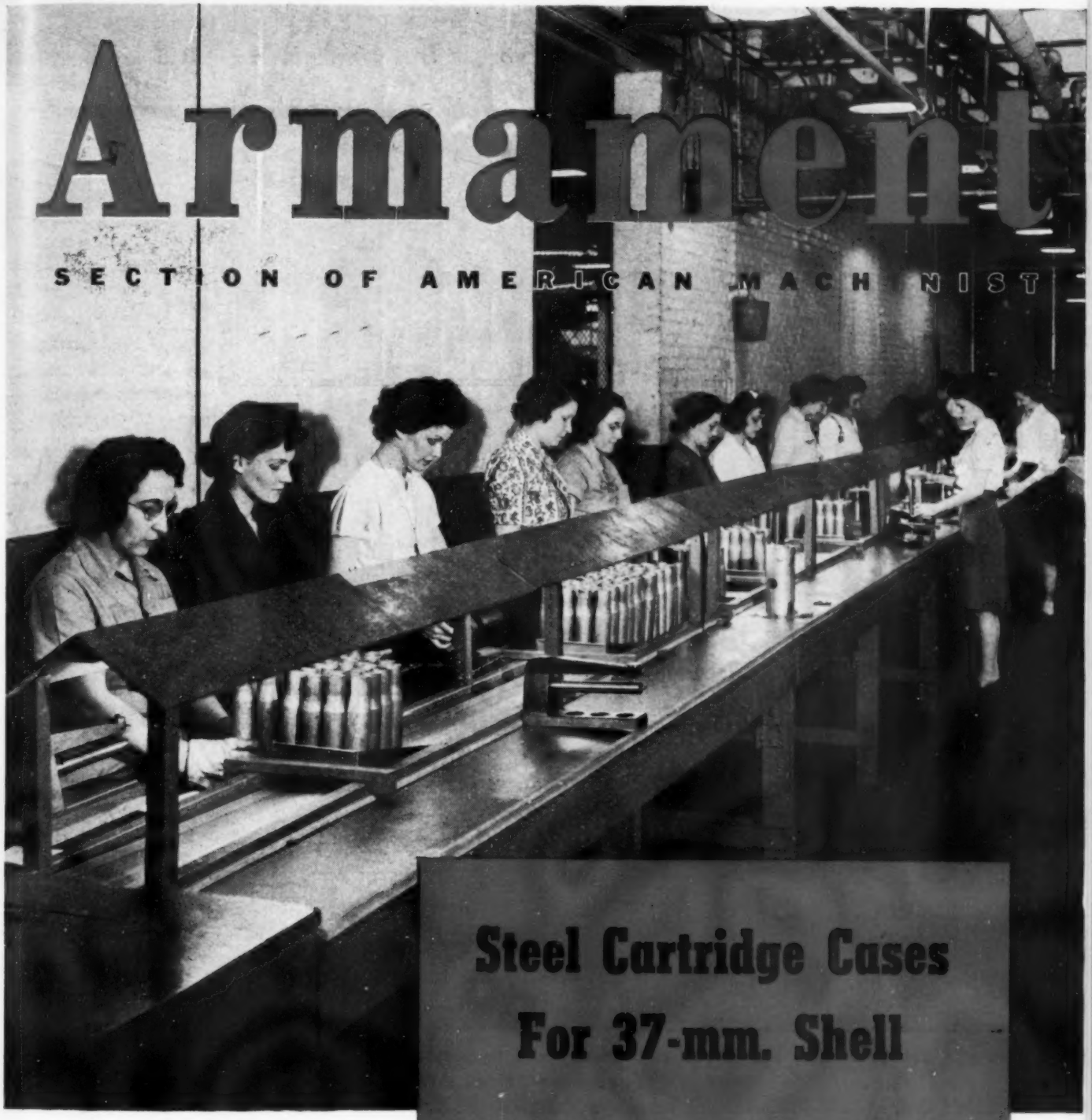
Since the propeller shaft tunnel decreases in height as it approaches the stern of the ship, each frame must be of a different height. Marks *G* indicate the length of each frame, the location of which can be marked with a center punch inserted in holes *J*. The legs are finally sheared at the punch marks.

This one templet has eliminated the use of multiple templets and individual layout for each frame. *Suggested by I. Williamson, Marinship Corporation.*



Arma-ment

SECTION OF AMERICAN MACHINIST



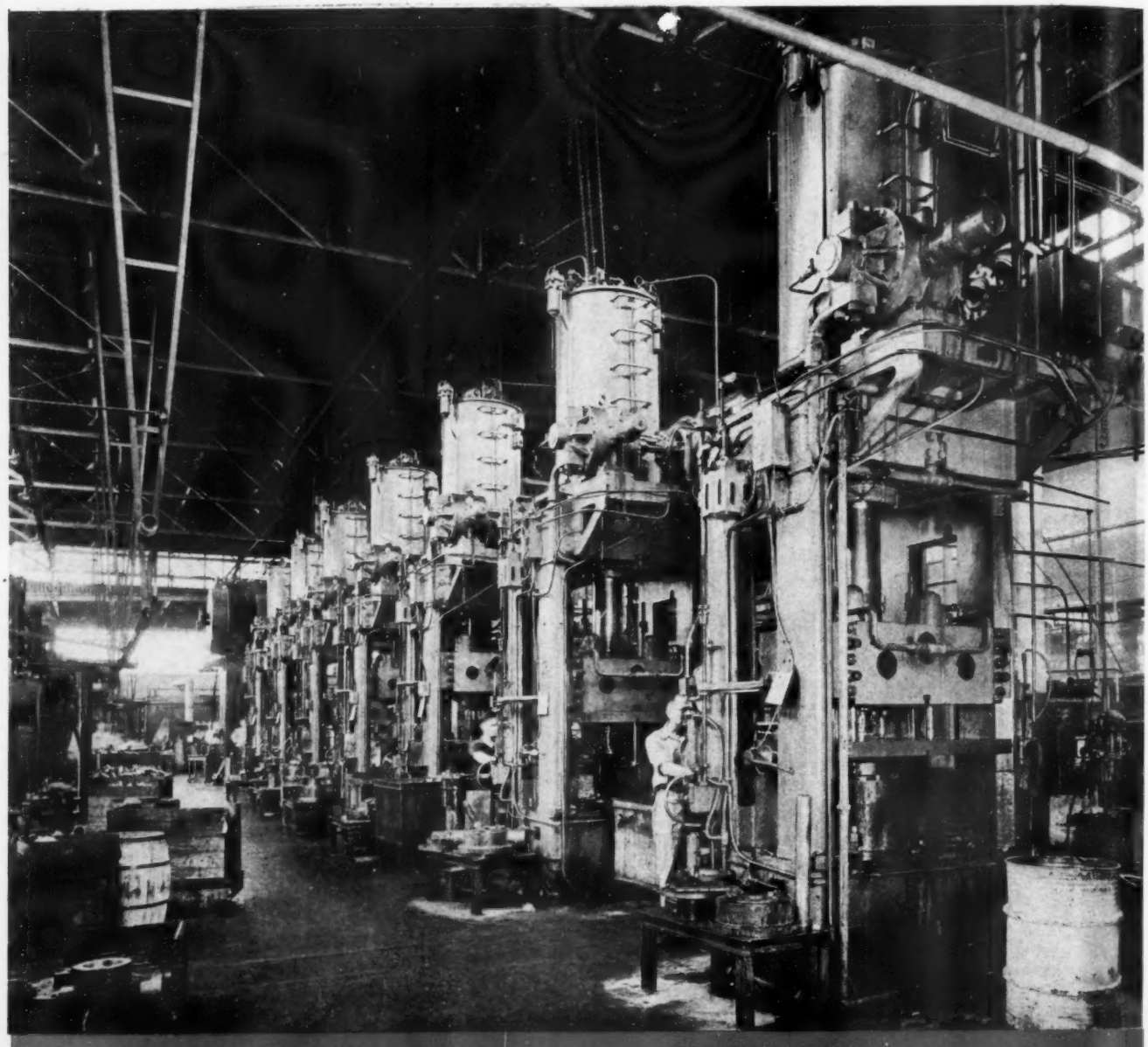
This conveyor-belt equipped inspection bench has been developed to make it easy for girl inspectors to handle large quantities of cases without fatigue. Thirteen final inspection operations are performed before the cases are turned over to Ordnance Department inspectors

Steel Cartridge Cases For 37-mm. Shell

By C. L. PATTERSON,
General Manager, Corcoran-Brown Lamp Division, The Electric Auto-Lite Company.

And LT. COL. HAROLD R. TURNER,
Cartridge Case Industry Committee, War Department

STEEL CARTRIDGE CASES FOR 37-MM. SHELL

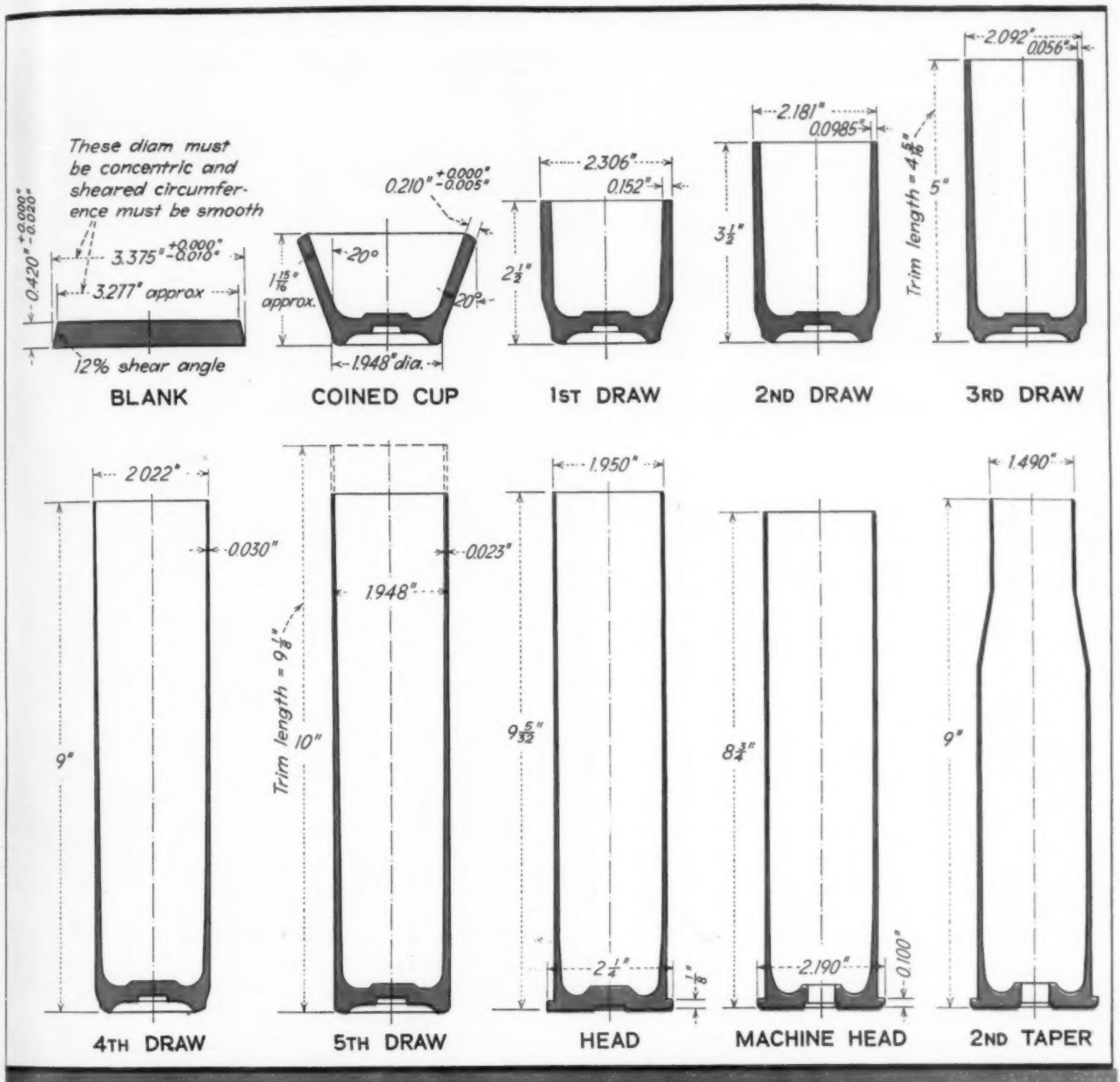


A battery of HPM hydraulic presses formerly used to manufacture automobile headlamps was retooled for drawing 37-mm. shell cases

THREE REQUIREMENTS must be satisfied in producing acceptable steel cartridge cases. First, the case must possess physical properties for obturation; that is, expand to seal the breech chamber against leakage of hot gases generated during firing, and contract after firing to permit ejection from the breech chamber. Second, the case must serve as a suitable container for the propellant; that is, stability in terms of storage, transportation and firing. Finally, the case must allow the assembly of a complete round of ammunition in one unit.

Experimental work on steel cartridge cases was initiated in a number of European countries during the first world war. Available evidence does not indicate successful wide-spread usage. The German case of that period was made up of several pieces joined together in a somewhat involved construction. It did not possess the physical properties now considered necessary for successful firing.

Before the start of the present conflict, Ordnance Department officers charged with cartridge-case design and production were awake to the desirability of developing suitable steel cartridge cases should it become difficult or impossible to obtain copper in sufficient quantities for brass cases. The possibility of making two- or three-piece welded steel cases from



Only five draw operations are necessary to cold form a 37-mm. steel cartridge case of the type shown. Mild steel blanks are used, and no heat-treating is necessary

mild steel was investigated only a few years ago, with unsatisfactory results. As a result, American manufacturers familiar with deep drawing steel products were asked to study the problem of producing one-piece cases. No steel products involving such heavy reductions had ever before been made successfully.

Among others, the Corcoran-Brown Lamp Division of The Electric Auto-Lite Company undertook to study this problem. While the chances of success seemed slight on the basis of past experience, tools for experiment on a one-piece 37-mm. case were prepared.

The one-piece steel cartridge cases made with these tools, thought to be the first produced by cold drawing a mild steel disk, were submitted to Frankford Arsenal. Firing tests showed that constant annealing of the metal had reduced its physical properties—the cases stuck in the guns.

There followed a long series of experiments to correct the manufacturing procedure, on hot-rolled stock. Heat-treated drawn cases were tried, abandoned because of difficulties with warping. The amount of annealing between draws was reduced to secure the desired results by a build-up in the physical properties of the case. Throughout these experiments which finally resulted in the selection of satisfactory steels,

and in the working out of a proper drawing procedure, the advice and cooperation of Ordnance Department officers, particularly Lt. Col. L. S. Fletcher, then located at Frankford Arsenal, was invaluable. Since its formation, the Cartridge Case Industry Committee, established by the War Department soon after war was declared, has been particularly helpful.

As a result of the experimental work done during the past two or three years by Corcoran-Brown and other cartridge-case manufacturers, troops in the Army of the United States and those of our allies are being supplied with vast quantities of ammunition whose powder charges are carried in steel cases. This has been done at a time when available stocks of copper for making cartridge brass were being depleted rapidly.

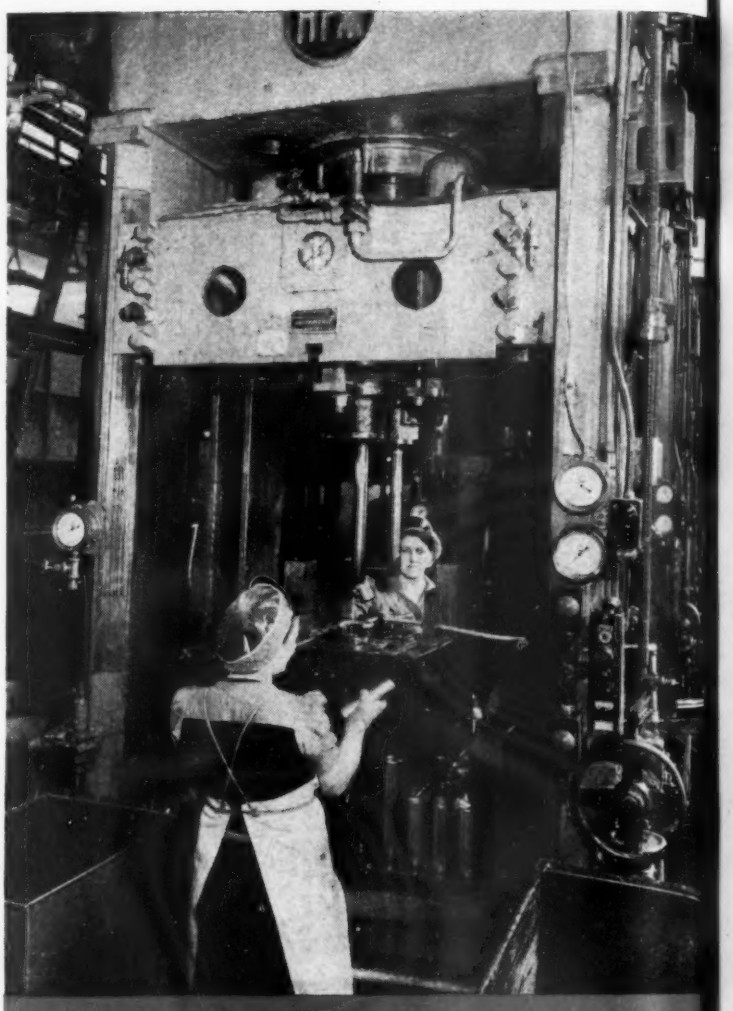
Many tests run with steel samples of various analyses and metallurgical conditions have shown that cold-drawn steel cartridge cases can best be made from a 0.20 to 0.30 carbon steel of carefully selected analysis and having small grain size. The material should be 100 percent spherodized and the blanks should have a hardness of 55 to 65 Rockwell B.

Efforts to Avoid Eccentricity

One experiment that helped determine "ground rules" for drawing steel cartridge cases was intended to find a way of avoiding eccentricity of the case walls, caused by blank slippage when contacted by the cupping punch. Efforts were made to insure concentricity of wall thickness by forming annular rings on the inside base section of the pieces. These rings produced folds which weakened the base, and ruptures resulted. Therefore, the use of annular rings was abandoned and the slippage difficulty partially relieved by sizing the blank to true up the edges.

Other experiments showed that very little work can be done on the base section of a case after it has been formed in the cupping operation. After the cylindrical cup has been formed from the coined cup in the first draw, punches and dies should be proportioned to apply drawing pressures only along the cylindrical wall. Little or no metal should be pulled over from the base section in the succeeding draws. Further, the cup in each succeeding draw operation must fit closely around the contour of the punch. The clearance between the cup and the punch should be the minimum that will insure entrance of the punch to the bottom of the case.

In determining the proper sizes and shapes for the different punches and dies used in making steel cartridge cases, Corcoran-Brown used die rings made of tool steel, nitrided to provide the required surface hardness. Once the correct die sizes were determined, cemented-carbide die-ring inserts were substituted.



Two punch and die sets are employed in each of the 150-ton HPM hydraulic presses used for cold drawing operations on cartridge cases for 37-mm. shell. Controls are interlocked to insure safety of the two operators

By contact with a coining fabricator, it was determined that one draw in the then group of six could be eliminated by use of a coined cup. More important, grain structure can be maintained in the head of the case, practically eliminating any chance of firing failures. Substitution of this method for the conventional cupping operation has resulted in the blanking, cupping and coining operations being done by a separate Ordnance Department contractor. The cup wall must be concentric within 0.008 in. for successful use in the draw dies.

Coined Cups Are Cleaned

As outlined in the accompanying table of operations, the first operation performed by Corcoran-Brown consists of cleaning the coined cups by passing

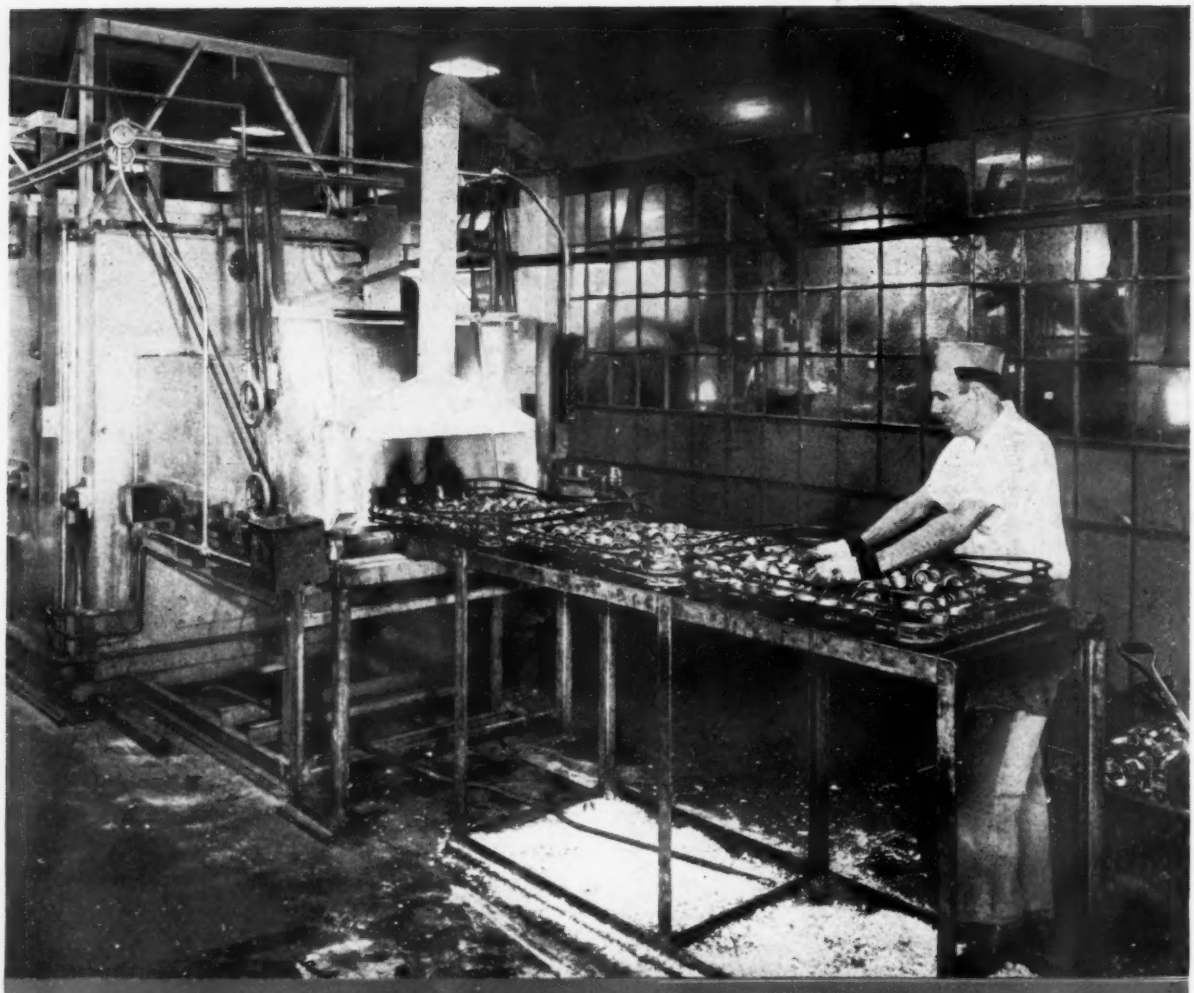
CORCORAN-BROWN OPERATIONS ON A 37-MM STEEL CARTRIDGE CASE

Operation Number	Operation Performed and Equipment Used
x	Blank, cup and coin—done by separate contractor.
1	Wash cup with hot alkali solution—Blakeslee belt type metal washing machine.
2	Anneal cup—No. 2 G.E. electric annealing furnace with reducing atmosphere for bright annealing.
3	Coat with No. 1033 Gilron neutral soap base coating—dip tank, wire baskets and pneumatic hoist.
4	First draw—150-ton HPM hydraulic press with two punch and die sets and two operators.
5	Wash case with hot alkali solution—same equipment as for operation No. 1. Cases placed on conveyor with open end down to drain readily.
6	Anneal case—same equipment as for operation No. 2.
7	Coat case—same equipment and solution as for operation No. 3.
8	Second draw—150-ton HPM hydraulic press with two punch and die sets and two operators.
9	Wash case—same equipment as for operation No. 1.
10	Anneal case—same equipment as for operation No. 2.
11	Coat case—same equipment and solution as for operation No. 3.
12	Third draw—150-ton HPM hydraulic press with two punch and die sets and two operators.
13	Trim mouth end of case—V & O automatic cartridge case trimmer.
14	Wash case—same equipment as for operation No. 1.
15	Anneal case—same equipment as for operation No. 2.
16	Coat case—same equipment and solution as for operation No. 3.
17	Fourth draw—150-ton HPM hydraulic press with two punch and die sets and two operators.
18	Wash case—same equipment as for operation No. 1.
19	Coat case—same equipment and solution as for operation No. 3.
20	Fifth draw—150-ton HPM Fastraverse hydraulic press with two punch and die sets and two operators.
21	Trim mouth end of case—V & O automatic cartridge case trimmer.
22	Wash case—same equipment as for operation No. 1.
23	Head case—800-ton Clearing mechanical press with six die sets on dial table.
24	Machine head and primer hole—New Britain-Gridley six-spindle automatic chucking machine.
25	Wash case with hot alkali solution—Blakeslee basket type metal washing machine.
26	Taper anneal—Morrison conveyor-type flame annealer.
27	Pickle in 10 percent sulphuric acid solution, rinse, neutralize in mild alkali solution—dip tanks and wire baskets.
28	First taper—60-ton Clearing mechanical press with six die sets on dial table.
29	Size (second taper)—60-ton Clearing mechanical press with six die sets on dial table.
30	Trim mouth end of case—V & O automatic cartridge case trimmer.
31	Burr mouth end of case—Delta bench-type drill press with special three-bit cutter and work-holding fixtures.
32	Wash case—same equipment as for operation No. 25.
33	Mouth anneal—Morrison conveyor-type flame annealer similar to that used for operation No. 26.
34	Stress anneal case—Surface Combustion furnace with flight conveyor.
35	Pickle, rinse and neutralize—same equipment as for operation No. 27.
36	Wash case and dip in soluble-oil solution—Blakeslee basket type metal washing machine and oil tank with dip baskets.
37	Final inspection of finished cases—inspection bench with canvas belt conveyor down center.
38	Clean cases—dip in solvent to remove oil film.
39	Stencil identifying data on side of case with marking ink—Markem automatic stenciling machine.
40	Varnish and de-tear—special Ransburg unit with overhead chain conveyor, portable dip tank and charged screens.
41	Bake varnish on case—Morrison oven with flight conveyor.
42	Pack cases in cartons for shipment.

FINAL INSPECTION OPERATIONS ON 37-MM CASE

Operation Number	Operation Description
1	Visual inspection for folds, cracks and other defects.
2	Check over-all length with go and not-go gage.
3	Check depth of counterbore in base end with go and not-go gage.
4	Check thickness of base with dial indicator comparator gage.
5	Check inside diameter at mouth end with go and not-go gage.
6	Check primer hole for size with taper plug gage.
7	Check flange thickness with go and not-go gage.
8	Check groove and flange diameters with go and not-go gage.
9	Check counterbore diameter with go and not-go gage.
10	Check height to shoulder (distance from base to datum diameter) with go and not-go gage.
11	Place case in special gage to check maximum profile.
12	Place case in special dial indicator gage to check the concentricity of the primer hole with the outside diameter.
13	Check wall thickness with special dial indicator gage.

Note: Operations 1 to 12, inclusive, are performed on all cartridge cases by shop inspectors. Operation 13 is necessary on only about 10 percent of the cases passed by the preceding operations.



Cups for steel cartridge cases are annealed before making each of the first four draws. A G.E. controlled-atmosphere furnace with a power-driven roller hearth is used for bright annealing

them through a conveyor-type Niagara washing machine in which the alkali solution is maintained at about 160 F. The cups are shoveled from floor trucks onto the mesh conveyor belt of the washer, and are delivered into a second truck at the other end of the machine.

Next, the cups are bright annealed in a General Electric furnace. They are carried through the furnace in wire-mesh baskets into which they are shoveled by the furnace operator. Only one layer of cups is placed in a basket, the operator scattering them to insure that each cup will be heated evenly. The baskets are in the heating zone of the controlled-atmosphere furnace for about 22 min. Temperature in this zone is held at 1650 F. by automatic controllers. The baskets then are moved by power-driven rollers into the cooling chamber of the furnace for slow cooling to about 180 F. in 60 to 65 min. At the discharge end of the furnace, the baskets are run out onto a roller table, the cups are dumped into a waiting truck, and the baskets are returned to the loading end.

The same annealing equipment and heating cycle are employed for the anneals which follow the first, second and third drawing operations. The cases are not annealed after the fourth and fifth draws. After each anneal, the cups or cases are checked for hardness—they must be held between 62 and 65 Rockwell B.

Soap Coating Eliminates Copper Plating

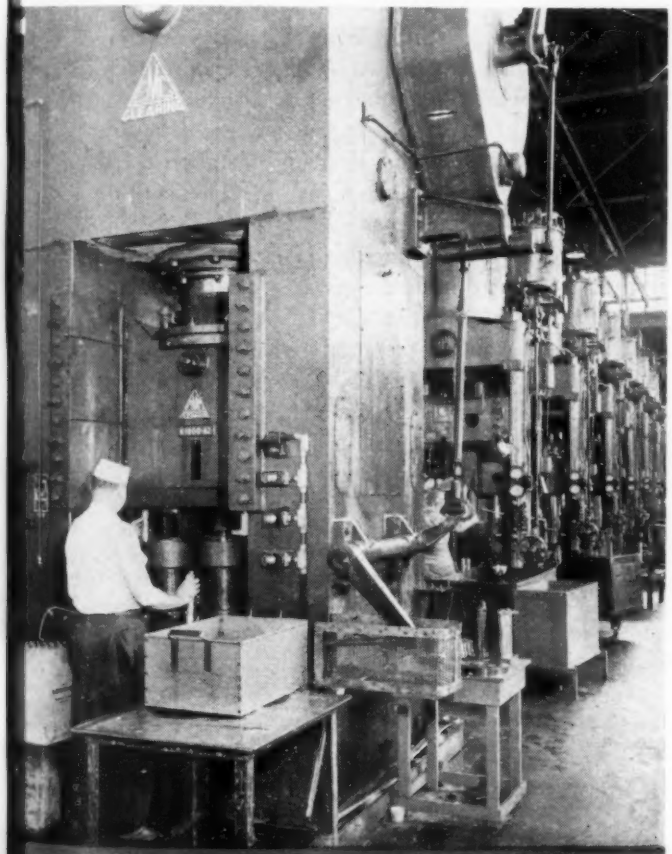
In the third operation, the cups are loaded into wire-mesh baskets for dipping into a tank of a neutral soap-base coating of a special type. This material is kept at about 210 F. Two baskets are used at each of the coating tanks, one basket being unloaded and reloaded while the second is suspended in the tank for 3 min. The baskets are transferred to and from the tank by pneumatic hoists.

The soap-base coating is applied to provide lubrica-

tion for the first draw operation. Originally, the cups and cases were copper plated before each draw to provide die lubrication. However, the soap-base coating has been found a satisfactory substitute and the copper is saved for other war uses. The coating now employed is easily stripped off the cups with cold water, and it is essential that they be kept away from water until the draw operation is completed. Sometimes difficulties are experienced with the coating being stripped off by moisture in the surrounding air. On humid days coated parts must be drawn within a few hours.

In the first draw operation, performed in a 150-ton HPM hydraulic press, the cup, which is approximately $1\frac{15}{16}$ in. in diameter at the base end and $1\frac{5}{16}$ in. long, is elongated to a length of about $2\frac{1}{2}$ in. Two punch and die sets are employed, with an operator on each side of the press, so that two cups are drawn in each cycle. Controls for the press are interlocked so that each of the operators must have both hands on control push-buttons before the press ram will descend. Actual pressure on the ram during the drawing operation is approximately 120 tons. This also is the average pressure exerted during each of the succeeding draw operations.

V & O automatic cartridge case trimmers are used for the three trimming operations necessary on the mouth end of each 37-mm. case



teel dials carry six dies for heading operations on 37-mm. hell. The operator has only to remove the headed pieces nd refill the dies with cases as they pass his position. he Clearing presses used for this operation work on a continuous cycle

It has been found that the 20-deg. entrance angle used in the carbide insert of the draw die ring, as well as the $\frac{1}{4}$ in. radius between this angle and the cylindrical throat of the insert, must be held closely for successful drawing of steel cartridge cases of the 37-mm. size. This is true of all of the draw dies of the series. Also, it is essential to flood a non-saponifiable lard-base coolant into the die and work during each of the drawing operations. This coolant must be kept free of water, as only a small percentage of water in the coolant will strip off the lubricating coating previously applied.

Following the first draw operation, the cases are washed, annealed and recoated to prepare them for the second draw. These operations are essentially the same as those described above, with the exception that in the washing operation the cases are placed by hand on the conveyor of the washer with the open ends down so they will drain readily. The second draw

operation, like the others in the series, is performed in a 150-ton HPM hydraulic press. Likewise, two punch and die sets are employed so two cases are drawn in each cycle.

During the second draw operation the wall of the case is reduced from 0.152 in. to 0.0985 in., and the length of the case is increased to about 3½ in. After this operation, the cases are washed, annealed and coated, as before, and the cases then are returned to the press line for the third draw operation.

Speed Reduced for Third Draw

In the third draw, the case length is increased to about 5 in. and the wall thickness is reduced to 0.056 in. While the presses employed for the first and second draws can be operated at up to 300 cycles per hour, this speed is reduced to about 250-275 cycles per hour for the third draw. The reduction in speed is due to the necessarily longer stroke and the longer time required to load the cases into the dies.

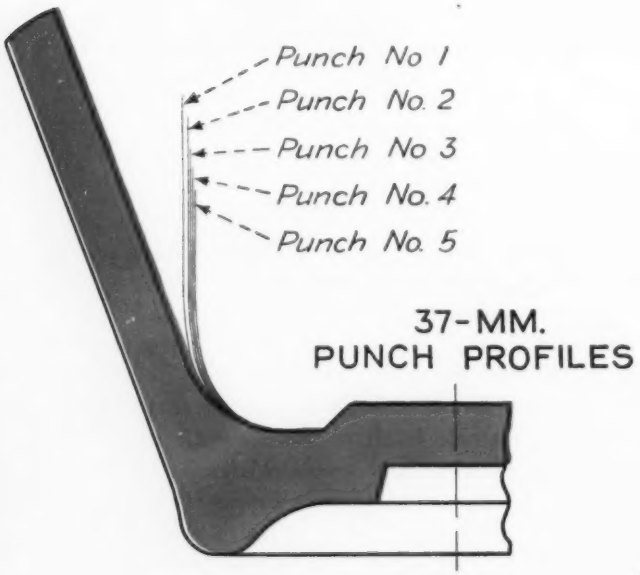
The first trimming operation follows the third draw. This is done in special V. & O. cartridge trimming machines at a rapid rate. The trimmers are entirely automatic, it being necessary for the operator only to keep the feed chute filled. The case length of about 5 in. is trimmed to $4\frac{5}{16}$ in. Next, the cases are washed, annealed and coated as before.

In the fourth draw operation, speed is reduced to about 225 to 250 cycles per hour. Little trouble is experienced in the first three draw operations in stripping the cases off the punches. However, in the fourth and fifth drawing operations stripping with the regular fingers in the bottom of each die set is not always successful. To reduce stripping difficulties in these operations, a hydraulic stripping arrangement is being tried out. The cooling liquid used on the press is pumped through the regular vent hole in the punch. Hydraulic pressure between the end of the punch and the bottom of the case cavity "cracks" the case off the punch about 1 to 1½ in. This loosens the case sufficiently to permit the stripper fingers to remove the case in the usual manner.

Severe Reduction in Final Draw

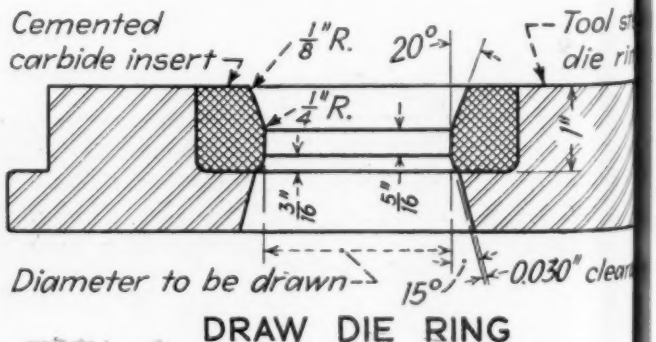
Following the fourth draw operation, the cases are again washed and coated. Annealing is eliminated to permit cold working of the metal to build up the desired physical properties in the wall of the case. Because the fifth and final drawing operation is the most severe of all, a second coat of the soap-base lubricant is applied over the first. For this second coat, the cases are set mouth-down on pin racks to insure a good coat inside the cases, to reduce scratches caused by heavy loading on the fifth draw punches.

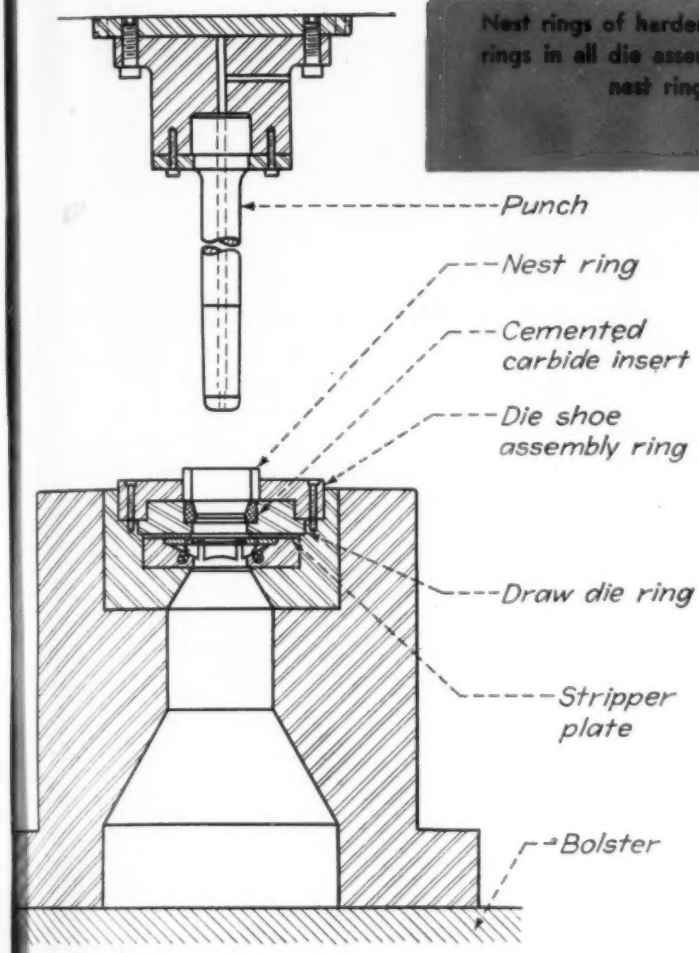
Practically half of the total reduction is accomplished during the final draw, but the same tonnage (120 tons) is exerted by the ram of the hydraulic press. A maximum wear of 0.003 in. is permitted in the throat of the carbide die insert for the fifth draw die. When wear and repolishing operations increase the diameter above this allowance, the insert is polished out to the diameter required for the fourth draw die. When worn more than 0.003 in., this insert in the fourth die is repolished for the third draw. This is repeated until the insert is worn too large



In each cold drawing operation, clearance between the work and the punch must be the minimum that will insure entrance of the punch to the bottom of the case

Throat shape is important in the die rings employed for cold drawing steel cartridge cases. Cemented-carbide inserts are used to insure long die life





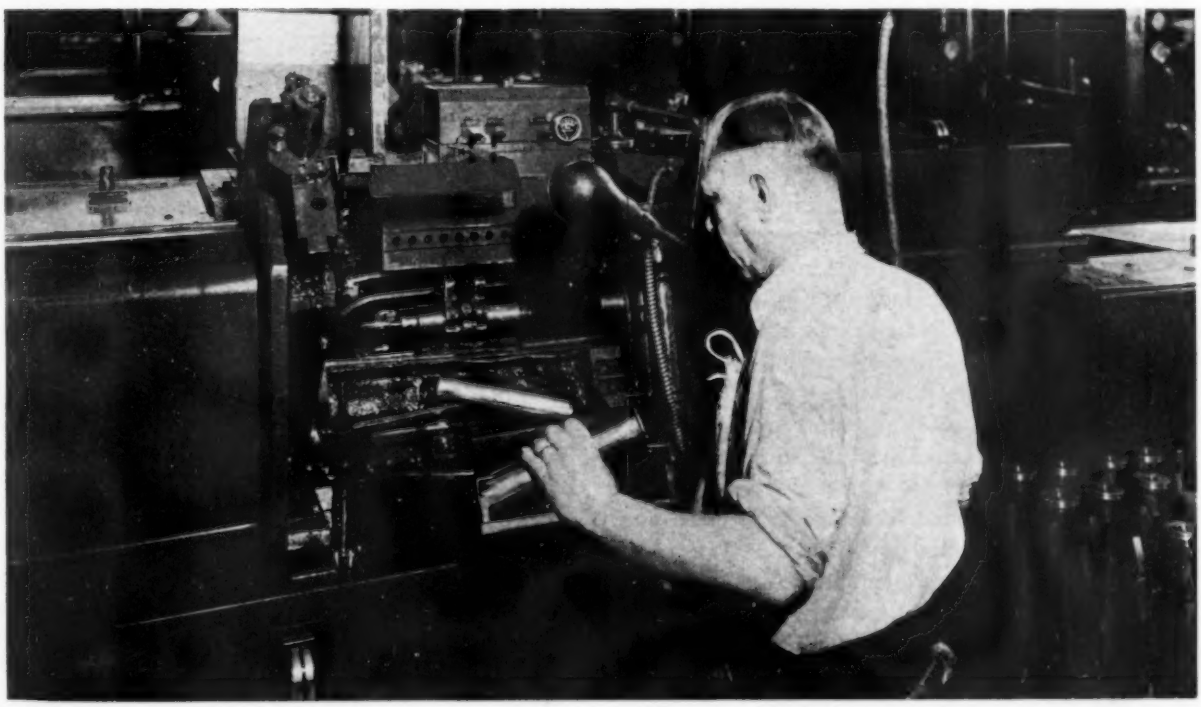
Nest rings of hardened tool steel are mounted above the draw die rings in all die assemblies except those for the first draw, where a nest ring is not required to locate the cup

for use in the first draw die. When the draw punches wear to a point where they are too small for use, they are salvaged by polishing and applying a hard chrome plate. Sometimes this plate may be as much as 0.002 to 0.003 in. thick with satisfactory results. Frequent polishing is necessary in the die rings and on the punches for the fourth and fifth draws, since the very high draw pressures cause trouble with scratched work if the tools are not properly maintained.

Dial Feed Used for Heading

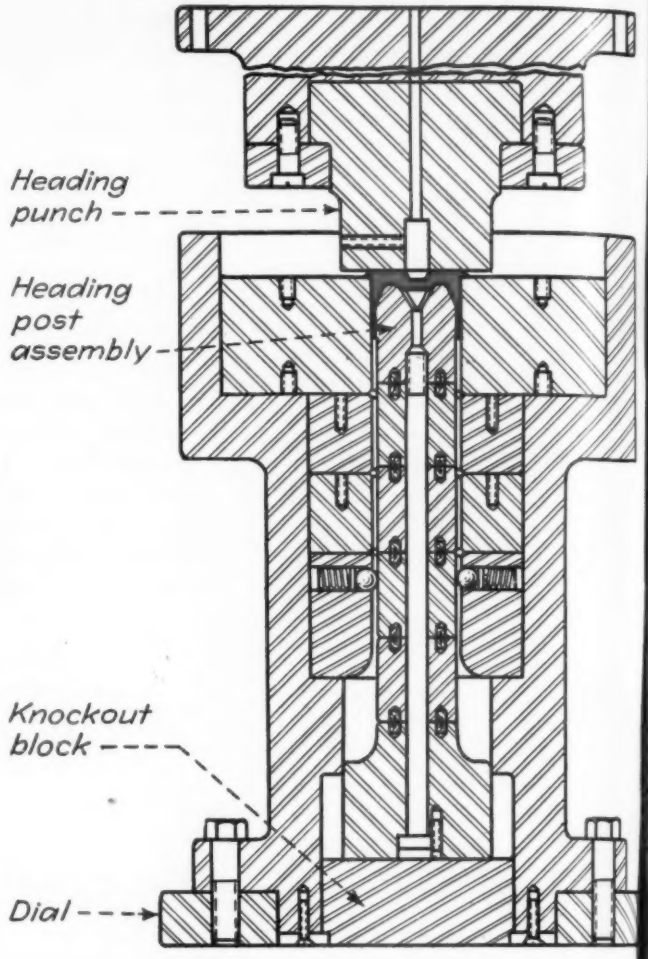
After the fifth draw, the cases are trimmed to a length of about $9\frac{1}{8}$ in. in special V & O cartridge case trimmers like those used after the third draw. Then, the cases are washed and delivered to the 800-ton Clearing presses for heading. Here, six heading dies are set up around a ratchet-operated dial on the bolster of the press and the machine is kept in continuous operation. The headed cases are raised in the dies automatically to loosen them for removal. This is done at the next station following the heading station.

New Britain-Gridley six-spindle automatic chucking machines fitted with loading chutes and with



Six-spindle New Britain-Gridley automatic chuckers machine the heads and primer holes of 37-mm. steel cartridge cases. Both high-speed steel and carbide-tipped tools are used

When the ejector lifts the headed case from the heading die, the ball detents shown prevent it from slipping back down into the die assembly



trays to catch ejected cases are employed for machining operations on the head end of the 37-mm. cases. Spindle speed is about 620 r.p.m. Cases are loaded into the collet chucks as they reach the No. 1 position. Then the head is turned with a carbide-tipped tool at the No. 2 position while the primer hole is being drilled with a high-speed steel stepped drill. At the No. 3 position, the head is rough faced and rough form-turned with carbide-tipped tools while the primer hole is counterbored with a standard high-speed steel tool. A high-speed steel circular form tool finishes the head at the No. 4 position while a high-speed steel taper reamer is used to finish the primer hole. Finally, the head is finish faced with a carbide-tipped tool and an inside chamfer in the primer hole is cut with a high-speed steel bit mounted in a boring bar at the No. 5 position. The cases automatically are ejected into a felt-lined steel tray at the sixth position. Finished cases are transferred from this tray to drain racks. Here, a shop inspector removes the cases and checks them 100 percent for size and concentricity of the head and primer hole surfaces.

Hot Alkali Wash Precedes Annealing

The cases next are washed with a hot alkali solution in a conveyor type Niagara washing machine, with the cases loaded in wire baskets suspended from an overhead chain-type conveyor.

Morrison conveyor-type flame annealers are employed for annealing the open ends of the cases before tapering. The cases are transported to these machines on pin-type racks and are placed head down in cups on the conveyor of the annealing machine. These cups rotate as they are carried past the burners so that the cases are heated evenly around their circumference. The burners are set at an angle and as the cases progress around the conveyor, the heat is applied at progressively lower positions. About 67 sec. are required for a case to travel through one of these machines.

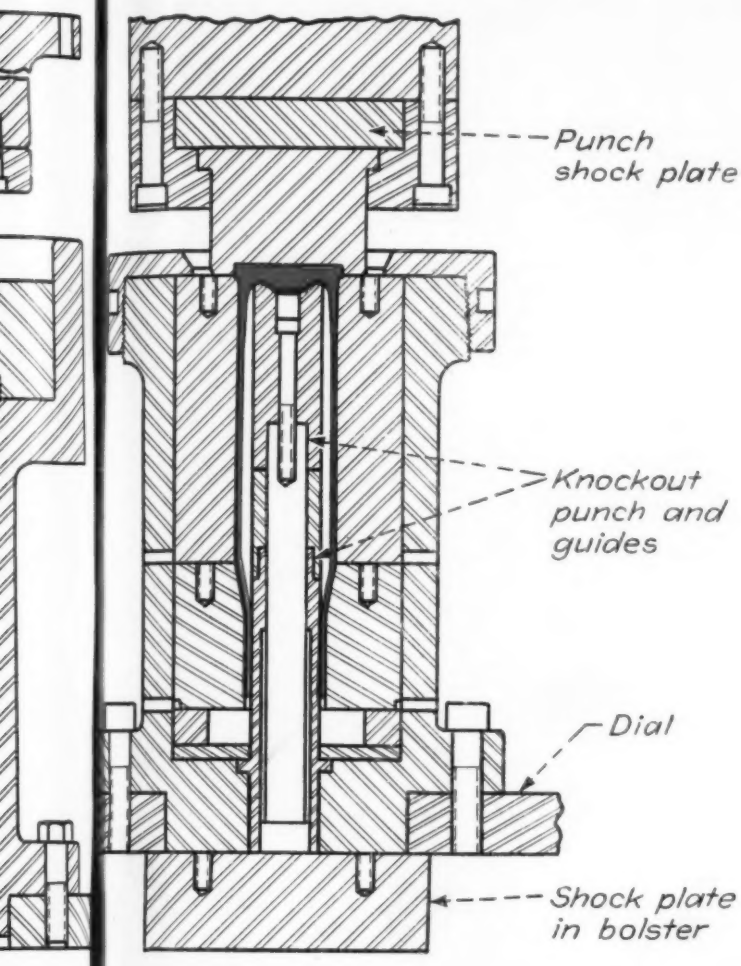
Cases are pickled after annealing. They first are dipped for about 5 min. in a 10 percent sulphuric-acid bath, then transferred to a cold-water rinse and a neutralizer bath maintained at 180 F. The mild neutralizer leaves a film on the surfaces of the case to aid in preventing corrosion.

Two tapering operations are necessary to form and size the tapered mouth of the 37-mm. cartridge case. Clearing 60-ton mechanical presses are employed for each of these operations, and the dies are very similar. Six die sets are mounted around a dial plate on each machine.

Beside each tapering and sizing press is an inspection bench. At the presses performing the first tapering operation, the inspector looks for buckled mouths and other defects, while at the inspection table beside the sizing press a number of gages are employed to insure that the cases are being finished properly. After sizing, the cases are trimmed to final length in V & O automatic trimmers. Then, the trimmed mouth ends are burred with special cutters in Delta bench-type drill presses. The cases are held in a vertical position in quick-acting clamps.

Automatic Mouth Annealing

After burring, the cases are again washed with a hot alkali solution, and then the mouth ends are annealed in Morrison flame annealers like those used for the taper annealing operation. Here, the burners are set to anneal only 1 in. down from the open end of the case. This is to permit crimping the mouth of the case around the base end of the projectile and give proper obturation in firing.



Like the drawing and heading dies, tapering and sizing dies are designed to permit easy replacement of worn parts. To minimize wear, bottom die rings for the tapering dies now are being made with cemented-carbide inserts

Next, the cases are suspended on wire hooks and passed through a large Surface Combustion conveyor-type furnace for stress relieving. The cases are held at 725 F. for about 20 min., and are in the heat zone about 50 min. during the furnace cycle. The cases then are cleaned by pickling, using the same equipment as mentioned above. Following the pickling operation, the cases are again washed, and then are dipped in a 50 to 1 soluble-oil solution which leaves a thin film that prevents rusting while the cases are being passed through the final inspection room.

Belt Carries Cases Through Inspection

The final inspection bench has an 8-in. wide canvas belt between guide rails down the center. Directly above this continuously moving belt is a line of fluorescent lights with a canopy which shields the inspectors' eyes from direct exposure to the lighting tubes. The belt moves at 12 ft. per min. Spaced down the bench are sheet-metal gates which extend across the belt at each inspection station. The inspector at any one of these stations selects a case from the belt, checks it with the proper gage, and replaces the case on the belt on the other side of the gate at her position. The case thus is taken along to the next station automatically. There are thirteen of these inspection stations along one side of the bench. Along the other side are placed Ordnance Department gages for use by government inspectors.

When passed by the company and Ordnance inspectors, the cases are returned to the shop for the finishing operations. The cases first are cleaned by dipping in a solvent that removes the previously applied oil film. A Markem stenciling machine then is used for marking identifying data on the side with a special ink, and the cases are hung on racks for the varnishing operation. These rack bars hold six cases each, the cases being suspended from spring clips fitted into the primer holes.

Originally, steel cartridge cases were protected by the application of copper plating. However, the seriousness of the copper situation made it necessary for Ordnance Department engineers to find some other protective coating. By working with varnish manufacturers, case producers and others, a phenolic-base varnish was developed that is giving satisfactory results.

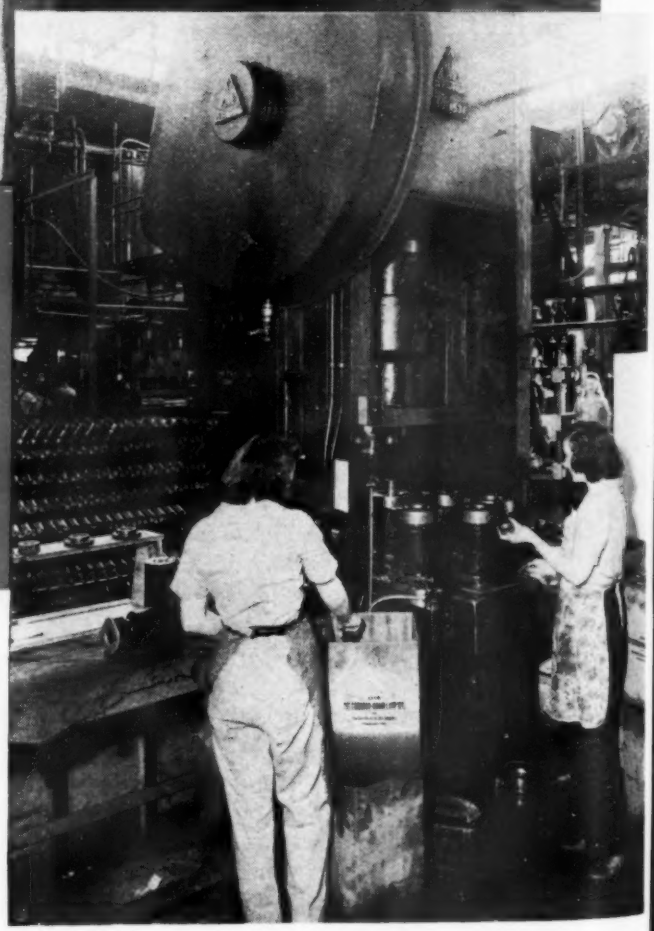
Varnish Dip Instead of Spray

At Corcoran-Brown, phenolic varnish is applied to the steel cases by suspending the cases from a continuously moving conveyor chain and passing them through a dip tank. From here, the conveyor passes the suspended cases mouth down across de-tearing screens charged with 130,000 volts by an X-ray transformer. This unit draws excess varnish off the mouth end of each cartridge case as it passes over the screen and eliminates any beading on the mouth rim. At the discharge end of the conveyor loop the racks of cases are removed, and then transferred by hand to the conveyor of a Morrison oven where the cases are baked at 450 F. for 45 min. to harden the 0.0005 in. thick varnish coat.

In the above discussion of drawing operations as performed on steel cartridge cases, nothing has been said about the percentage of reduction accomplished during each stage. This has been done purposely, because limiting factors have not yet been determined and it is very possible that as we become more experienced with these extremely deep drawing operations on 37-mm. and other steel shell cases, we will be able

Morrison flame annealers for the taper and mouth annealing operations have continuous chain-type conveyors equipped with rotating cups to hold the cases vertically while they are heated

Clearing 60-ton mechanical presses are used for the tapering and sizing operations on 37-mm. steel cases. Each press has six die assemblies on a dial unit to permit continuous operation without danger to the operator



to accomplish considerably greater reductions than now are thought practical. These developments also undoubtedly will result in further experiments along the same line when the war is finally won, with a resulting increase in knowledge of very deep draws in cold steel. Entirely new horizons have been opened by the successful development of methods for producing satisfactory one-piece steel cartridge cases.

Tolerances for Bevel and Hypoid Gears—I

A standard practice adopted by the American Gear Manufacturers Association, and known as "Inspection and Tolerances for Gears—Part III."

FOREWORD

This standard practice, subject to periodic revision, is intended to form a practical basis upon which gears can be manufactured, inspected, sold or purchased, although it is not necessarily a rigid specification. It is emphasized that ultimate performance is the final criterion in the acceptance or rejection of gears, regardless of whether they meet arbitrary tolerances. In other words, if gears run smoothly and carry their rated load without breakage or appreciable wear, they will be acceptable for many applications. But when gears fail to perform satisfactorily, definite inspection methods and tolerances are invaluable in locating the cause.

An important consideration is that of the relation of cost to accuracy. Production of gears to the closer tolerances always costs more. In some instances, stipulation of the closest tolerances when they are not needed, may result in a cost several times what it should be.

In contrast to spur and helical gearing, the satisfactory operation of bevel gears cannot be so readily predicted from tooth-error measurements. In spur and helical gearing the pitch and tooth shape remain constant across the face width, whereas, in bevel and hypoid gearing all linear dimensions vary with the cone distance, and in spiral bevel teeth the pressure angle and spiral angle likewise vary. Specifications indicate what tools and cutters are to be used but do not give exact values in the gear teeth. Correctness and uniformity between similar gears in respect to pressure angle, spiral angle and tooth shape, instead of being shown by direct measurements, are best determined by running a gear and pinion together in proper position under light load in an accurately graduated testing machine, and observing the tooth bearing and sound.

SCOPE

These tolerances apply to straight, spiral and zerol bevel, and hypoid gears.

DIAMETER RANGE

The diameters considered are from $\frac{3}{4}$ to 100 in., arranged in a geometric progression; namely $\frac{3}{4}$, $1\frac{1}{2}$, 3, 6, 12, 25, 50 and 100 in. Tolerances for other diameters may be interpolated.

PITCH RANGE

The pitches considered are from 1 to 32 diametral pitch, arranged in a geometric progression; namely, 1, 2, 4, 8, 16 and 32. Tolerances for other pitches may be interpolated.

CLASSES AND SPEEDS

Three classes of bevel gears are listed according to use. These are:

	Ft. per min.
Precision high-speed	over 2,000
Commercial high-speed	up to 2,000
(Straight-bevel limitation	up to 1,000
Commercial medium- and low-speed	up to 400

These classes of gears and their definitions in terms of speed are arbitrary. The name "precision high-speed" is assigned merely for convenience. There are cases when tolerances for precision high-speed bevel gears are applicable for lower speeds, for example: timing mechanisms, dividing gears, instruments and gun-sighting gears. Likewise the tolerances for the medium- and low-speed gears may be satisfactory for higher speeds in some instances.

TYPES OF ERRORS

The fundamental errors for which tolerances are given are:

1. Runout
2. Pitch error
3. Accumulated error
4. Required tooth contact

Tolerances for backlash are not included because of the separate standard Practice of the A.G.M.A. for "Backlash in Gears." Tooth-thickness measurements are related to backlash and are therefore omitted.

Tolerances for various dimensions of bevel gear blanks, such as hole size, outside diameter, face width and face angle are not yet established, but may ultimately be included because of their importance to gear accuracy.

Tolerances for surface finish and for quietness are considered beyond the scope of this standard practice.

To clarify the meaning of the four types of errors considered, each is defined and explained briefly.

1. *Runout*

Runout of a gear is the total difference between high and low readings of a dial indicator suitably arranged to denote the off-center relation of the axis of the tooth profiles with respect to the journals or the axis about which the gear rotates. It is twice the eccentricity. It includes the effect of side runout or wobble.

A gear cutting or grinding machine in proper operating condition should produce teeth without appreciable eccentricity in relation to the axis of rotation of the machine. When eccentricity occurs, it is almost always due to inaccuracies introduced when the gear is removed from the cutting or grinding machine and mounted somewhere else for inspection or operation. Runout and eccentricity can be held to close limits only by having true and accurate fits in journals and bores of blanks, shafts, arbors, and chucks.

Runout of bevel and hypoid gears is most commonly measured by using a testing fixture arranged with two fingers, one fixed and the other actuating a dial indicator, both of which are mounted on movable blocks with means to return the blocks always to the same position. The blocks holding the fingers are positioned approximately 180 deg. apart, with the fingers making contact on the same set of profiles at the mid-face. A spring tension device is desirable to keep a definite uniform tension of the gear against the fixed finger. The difference between the highest and lowest indicator readings around the gear represents twice the runout, or four times the eccentricity.

A modification of the above fixture utilizes a spring-actuated plunger in lieu of the fixed finger. It is arranged to contact both sides of a tooth space simultaneously, thereby serving to lock the gear at each successive position. This eliminates the need for a spring-tension device.

Obviously readings obtained by either method are influenced by pitch and profile errors, but the two latter are in most instances relatively small as compared to the runout error, and their effect is therefore usually ignored in making this test.

2. *Pitch Error*

Pitch error of a bevel or hypoid gear is the maximum difference between any two successive tooth-to-tooth readings taken in a plane of rotation at the mid-face between corresponding sides of adjacent teeth.

Either set of profiles may be used for tooth-to-tooth readings, but preferably the driving sides if the gear operates in one direction only. It is ordinarily unnecessary to take tooth-to-tooth readings on both sets of profiles, provided both sides of the teeth were generated or cut simultaneously.

Tooth-to-tooth readings may be taken by using a device consisting of a pair of fingers contacting adjacent teeth, one fixed and the other actuating a dial indicator, both of which are mounted on a movable block or slide that has some means to return the slide always to the same position. A spring-tension device is desirable to keep a definite uniform tension of the gear against the fixed finger. The indicator is set at zero or some arbitrary reading for the first pair of teeth, and all readings between successive pairs of teeth are relative to the first reading. In interpreting the readings, it is important to note that the readings are not errors; it is the *differences* between successive pairs of readings that denote pitch variations or differences be-

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Tolerances for Bevel and Hypoid Gears—II

tween individual readings and the average reading.

The pitch-error readings may or may not be influenced by the runout, depending upon whether the stop on the indicator slide operates against a stop external to the gear, or against the bottom lands of the teeth, or the face. It is preferable to have pitch-error readings independent of runout, because runout is mainly a function of blank processing and set-up and can be readily determined separately, whereas pitch errors are mainly a function of the gear cutting machine. On gears with high numbers of teeth, the runout effect on tooth-to-tooth readings is so gradual that it may be ignored, unless the readings are to be used subsequently as a basis for deriving accumulated error.

Direction of the pitch circle at mid-face has been selected as the direction of measurement for bevel and hypoid gears. In the case of straight bevel gears, or gears having a low spiral angle at the pitch diameter, the tooth-to-tooth readings may be taken with a dial indicator in the direction of the pitch circle. But at higher angles the indicator may give false readings from the side cramping effect of the angle. In such cases the indicator may be set normal to the tooth surface, and readings converted to the direction of the pitch circle for purposes of comparison and standardization by dividing by the cosine of the spiral angle and by the cosine of the pressure angle at that diameter.

In the case of spiral bevel and hypoid gears with unusually high spiral angles, these tolerances, which are stated in the direction of the pitch circle, should be increased in the approximate ratio of:

$$\frac{\cos 35 \text{ deg.}}{\text{cosine of gear spiral angle.}}$$

3. *Accumulated Error*

Accumulated error of a gear is the maximum accumulation of pitch errors obtained by algebraic addition of tooth-to-tooth pitch errors.

In deriving the accumulated error, the tooth-to-tooth pitch errors must be corrected with reference to true pitch. The method is the same as explained in "Tolerances for Spur and Helical Gears," published previously.

Unless otherwise specified, accumulated error is checked over the entire 360 degrees, and expressed as the maximum error between any two teeth. In some cases it is measured only for one-half or one-third of a circle, and occasionally tolerances are set for accumulation over any three or four adjacent teeth.

Accumulated error may also be obtained by comparing the tooth alignment with a master gear placed adjacent to it, or by comparing tooth spacing with divisions on a master graduated plate or circular table.

Measurements for determining accumulated error may or may not include the effect of runout and wobble. In setting the tolerances it was assumed that they do not include the effect of runout or wobble.

For low- and medium-speed gears, accumulated error is of minor importance unless the gears are to be used for timing mechanisms, dividing gears, gun-sighting devices, or the like. Even on high-speed gears, it is secondary in importance to pitch error or tooth contact.

Accumulated error may be derived for any gear for which tooth-to-tooth readings are available, although it is a rather tedious check to make on large gears. An occasional check to see that the gear cutting machine is cutting within the desired accumulated-error tolerance is usually all that is necessary.

4. *Required Tooth Contact*

Determination of the proper tooth contact is best accomplished by means of a testing machine, as mentioned in the foreword. Proper contact involves three factors; namely, position, shape, and area of contact.

In inspecting bevel and hypoid gears, it is desirable to determine not only if a satisfactory contact will be obtained when the gears are ideally mounted, but also to what extent the contact will be modified by axial (in and out) and radial (up and down) variations of the pinion mounting with respect to the gear. This testing procedure is commonly known as the "V" and "H" check.

The desired position and shape of contact are adequately covered in the standard practice of the A.G.M.A. for "Adjustment of Bevel Gears in Assembly."

The required minimum initial area of contact for the various classes of bevel gears is listed herewith. The percentage of contact is a matter of judgment by eye, because precise methods of measuring such areas are impractical.

Proper tooth contact is the most critical test in checking bevel gears.

INSPECTION TOLERANCES FOR STRAIGHT, SPIRAL, AND ZEROL BEVEL, AND HYPOID GEARS*

CLASS	DP	Runout of PD, Total Indicator Reading								Pitch Error Measured at Mid-Face in Plane of Rotation								Accumulated Error Between Any 2 Teeth Exclusive of Runout Effect								Required Minimum Initial Area of Contact, Per Cent
PD		¾	1½	3	6	12	25	50	100	¾	1½	3	6	12	25	50	100	¾	1½	3	6	12	25	50	100	
Precision	4	..	..	..	8	10	14	18	24	..	..	..	3	4	5	5	6	..	..	..	10	10	12	20	30	
High-Speed	8	..	..	8	8	10	14	18	..	..	..	3	3	4	5	5	..	..	..	10	10	10	12	20	..	
Over 2000	16	..	8	8	8	10	14	..	..	..	3	3	3	4	5	..	..	..	10	10	10	10	12	..	..	70
Ft. per min.	32	6	8	8	8	..	..	..	..	3	3	3	3	..	..	..	..	10	10	10	10	..	..	..	..	
Commercial	2	..	..	..	..	16	20	24	28	..	..	..	5	6	7	7	8									
High-Speed	4	..	..	..	14	16	20	24	..	..	..	5	5	6	7	7	..									
Up to 2000	8	..	..	14	14	16	20	..	..	..	5	5	5	6	7	7	..									60
Ft. per min.	16	..	12	14	14	16	20	..	..	..	5	5	5	6	7	..	..									
Note: Straight bevels limited to 1000 Ft. per min.	32	10	12	14	..	..	..	..	..	5	5	5	5	6	..	..	..									
Commercial	1	..	..	..	..	20	24	32	40	..	..	..	..	8	9	9	10									
Medium- and	2	..	..	..	..	20	24	28	..	..	..	..	..	8	9	9	..									
Low-Speed	4	..	..	..	16	20	24	..	..	..	..	..	7	8	9	..	..									50
Up to 400	8	..	..	16	16	20	24	..	..	..	..	7	8	8	9	..	..									
Ft. per min.	16	..	16	16	16	20	24	..	..	..	7	7	8	8	9	..	..									

* All readings in ten-thousandths of an inch.

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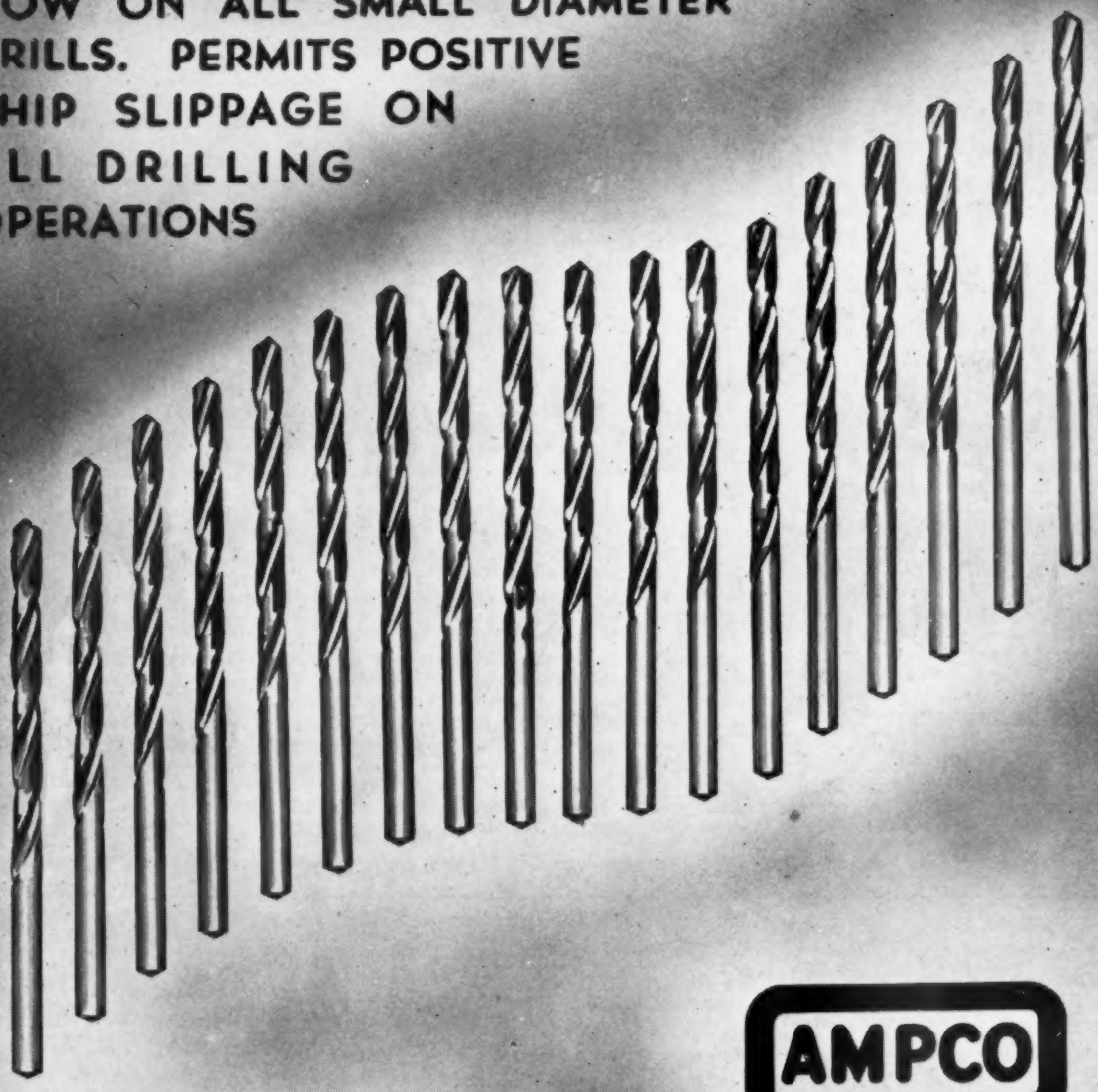

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What Are We Waiting For?

IN THE MIDST of military and naval successes, war production is not what it should be.

The projected schedule for 1943 calls for a steady rise month by month throughout the year. That rise was interrupted in May, and June figures were far from satisfactory.

What is responsible for this sudden and unanticipated letdown in effort on the home front?

It isn't plant capacity. Facilities with which to do the job are now in place. Some forty billion dollars have been expended for such purposes and the program is virtually complete.

It isn't raw materials. There was a time not long ago when manufacture of war goods was seriously hampered by a critical shortage of materials, but that condition has been corrected in recent months. The raw materials are at hand for the task ahead.

It isn't manpower. There are local spots where enough labor is not available, but the overall labor situation nationally is not yet so acute as to be a major factor in a slump in the production schedule.

It isn't machinery and plant equipment. The builders of such equipment have performed a magnificent service to the nation. War plants in general are adequately furnished with the tools to turn out the work required.

What then is the trouble? As nearly as you can put your finger on it, the fault is to be put at the door of over-confidence and complacency and an alarming lack of comprehension of the task that lies ahead.

There is too much feeling that the "beginning of the end" in the war with Germany and Italy means that the end is just around the corner.

Contrary to that, the shooting war is just starting. Months, perhaps years, of hard fighting face our armed forces. If industry fails to meet the timetable of production set up for it this year and next, victory will be postponed and the cost may be felt in the needless sacrifice of thousands of lives in battle.

Let's get one thing straight. We have not reached the "coasting" period in war production. That period isn't even in sight.

To reach the established goals for 1943, industry must produce in the last six months over half again as much war goods as in the first six months. In planes alone, measured by weight, the airplane industry the last half of the year must double its output compared with the first half.

What is more, the proposed production rate for every month in 1944 is higher than the all-time peak to be attained before the end of 1943.

That is a tough assignment. It demands every ounce of energy that management and labor alike can put into it.

This is no time to be free and easy. Having already achieved a miracle of performance, industry cannot afford at this crucial stage to relax even one minute.

As one high official puts it, "We have everything with which to do the war production job. What are we waiting for?"

Burnham Finney

GAGING BUSINESS

When they should be giving everything for the home-stretch spurt, war workers are resting on their oars, effects of coal strike will extend over long period and through many industries. WPB to boost laggards. Tools generally over the hump

Confidence Up, Output Down Although projected schedules call for a steady and uninterrupted rise in war production every month this year until at least the late fall or early winter, output has been virtually on a plateau for three months. Washington officials are hopeful that the July total will reveal a resumption of the upward trend. Gains were made in some items in June, but the improvement was relatively small. Aircraft output was the biggest disappointment.

Practically none of the responsibility for being "on dead center" can be put on raw materials shortages. Plant facilities also are available in sufficient numbers. Manpower is causing trouble in some spots, especially aircraft, but is not holding up production. A large share of the blame for the letdown in operations must be borne by the over-confidence that prevails and the feeling that the war already is won.

Coal Strike Has Long Effect The coal strike promises to be felt for months in its adverse effect upon war production. In steel alone it is conservatively estimated that a minimum of 250,000 tons has been lost this year because of forced shutdowns, and the final figure may well run closer to half a million tons. The most damaging effect will be in steel for shipbuilding. Whether it will be possible for the steel industry to get out the extra two million tons asked of it this year now seems in doubt, though there is still a chance. The pinch in manpower will be tighter in the months ahead.

Battle Experience To Guide Review In an attempt to boost the overall war production rate as rapidly as possible WPB officials will concentrate on companies that are behind schedules. Review boards of the armed services plus WPB are in the process of taking a look at requirements for munitions and other war goods in the light of battle experience. The result may be some cutbacks in items that heretofore have not been cut. If that happens, however, it will not mean that any decrease will occur in war production as a whole, because the slack will be more than taken up by increases in aircraft and shipbuilding.

At the earliest opportunity and probably before the end of the war, conversion to manufacture of some essential civilian goods will be permitted as necessary raw materials become available. For one thing, authorization is likely to be given for limited automobile production. Washington is conscious of the need for a more plentiful supply of repair parts and will allow such manufacture in greater quantities. This will be particularly true in the field of transportation.

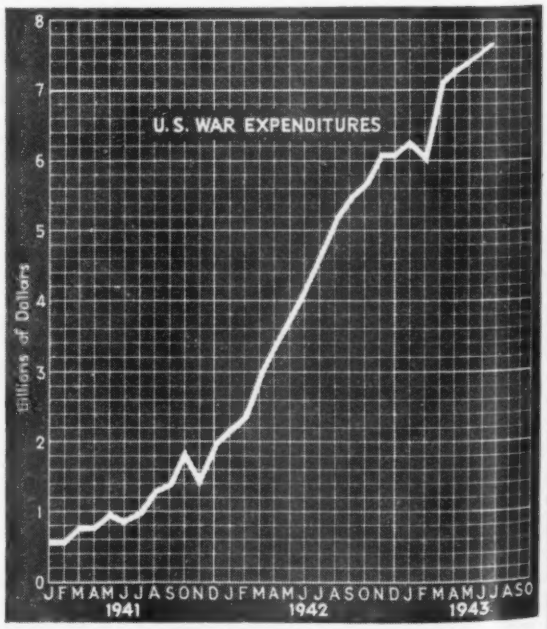
Must Up Planes To Meet Goal Airplane manufacture is the biggest headache in war production. It is hoped that in July 8,000 planes will be built. The aircraft program for the last six months of this year is so great that in order to carry it out production, based on plane weight, must be doubled compared with the first half of 1943. Aircraft production will not reach the contemplated peak until December or January. Shipbuilding is up to schedule. Despite the sharp improvement in the shipping situation brought about by decreased sinkings of ships by submarines and by the reopening of the Mediterranean, there is no possibility of any cutback in merchant shipbuilding until the latter part of 1944.

Output of ordnance products is reported satisfactory. That applies to both Army and Navy ordnance. It is believed that the so-called "pipeline" of munitions will be filled by early next year, if not sooner, and from then on the production rate of some items at least will be governed by the usage.

Tool Shipments, Orders Decline Machine tool shipments from factories in June amounted to $107,000,000, as against $113,000,000 during May. A further decline is looked for this month. Output of machine tools in the first half of 1943 is now estimated at about $685,000,000, an all-time high. Even if a severe slump should come later, as appears inevitable, total production for the year will be comfortably in excess of one billion dollars, though it probably won't hit the mark of $1,360,000,000 set in 1942. Net orders booked by machine tool builders in June declined to around $30,000,000, the lowest since the industry began to hit its stride in the war tooling program.

WPB no longer will give pool orders to machine tool companies. From now on the industry is on its own in booking war orders. Certain lines of machine tools are very tight, such as gear grinding machinery, gear cutting machines and special single-purpose machines. By contrast, delivery has eased greatly in many kinds and sizes of machine tools. Many companies now are seeking work as subcontractors to prime contractors making war goods other than machine tools. WPB is seeking aid from machine tool builders in doing aircraft engine work on a subcontract basis. Some companies already are doing such outside jobs.

And up Some More — War expenditures for June amounted to $7,688,000,000 an increase of $315,000,000, or 4 percent over May. Expenditures for war purposes for the fiscal year 1943 amounted to $75,100,000,000, or 2.7 times the $28,300,000,000 expended in fiscal year 1942 and 11 times as much as the $6,700,000,000 in fiscal 1941. From July 1, 1940 to June 30, 1943, war expenditures by the U.S. Government totaled $110,000,000,000



Truman Aircraft Report Charges Use of Defective Parts

As with Carnegie-Illinois Steel, the Curtiss-Wright report tells of inspectors using their own judgment when interpreting specifications. The Army was handling the situation

BY ROBERT COLBORN

WASHINGTON—It will be some time before facts and their significance can be sifted from the malarky in the Truman Committee's report on military aircraft. The report itself—30 pages of close print, will not be generally read. There is more misinformation and amateur opinion in it, which would mislead most non-technical persons, even if they read it. Public and non-aviation technical opinion on this important matter will derive mostly from condensed news stories. The Curtiss-Wright Corporation and the Glenn L. Martin Company, both large units in this country's biggest industry, deserve at least the open minds of everybody till the truth can be made known.

The Truman Committee is composed of able congressmen, who are making a conscientious effort to keep a check on war production at a time when the dishonest minority could take advantage of the war's hubbub. While the rest of Congress has gone home to vacation and check constituent opinion and ballyhoo itself, Truman's group is still at work in Washington's steam bath summer, checking on the hot-shot executives and the admirals and generals who sometimes make mistakes.

Basis of Report

The report cooks down to a few basic contentions: Three or four Curtiss-Wright airplanes and a couple of Martin planes are turning in a poor performance. Curtiss-Wright has been too slow in developing a dive bomber that isn't so good anyway. But worst of all, the Committee says that Wright Aeronautical Corporation's plant at Lockland, Ohio, falsified its inspection reports on the production of aircraft engines, jeodardizing the lives of men who will fly them.

Taking up these charges, AMERICAN MACHINIST, whose representatives have talked with the principals in this case, attempts to report current reasoning which will help readers to think it out for themselves as more information becomes available. First, the Curtiss-Wright P-40 fighter and the Martin medium bomber B-25, are the important mass-production planes under attack by the Committee. There is not room here for any discussion of their merits. Suffice to say that Army knew all the facts and has already made decisions to curtail their production before the Truman group brought any pressure on it. Therefore, publication of the information accomplished nothing, except it let the public know that Congress is watching the airplane builders. On the other hand it damaged the morale of the boys who will fly these planes—they must be flown for months to come—and especially it discourages the thousands who must build them—for months to come.

A Fine Line Divides

At Columbus, Ohio, Curtiss-Wright for a long time has been trying to develop a dive bomber, the SB2C for the Navy, without success. Quite a number of them have been produced, and some were sent to sea on carrier shake-down cruises. At this writing the SB2C is teetering in the balance between rejection for keeps or acceptance as the makings, with some changes at modification centers, of an effective machine. It would take a board of technicians to determine whether long delay on the SB2C was due to poor management. The Navy has had Curtiss-Wright on the carpet more than once; the management was changed; recently one of the company's top executives took personal charge of it. It was never publicly known that Lockheed's P-38 Lightning twin-engined fighter was in the dog house for months on end and was saved from the scrap heap by only two or three Army officials who had faith in it. Today it is the darling of the Air Forces the world around. This incident is related to show the narrow margin between the public pillory and applause.

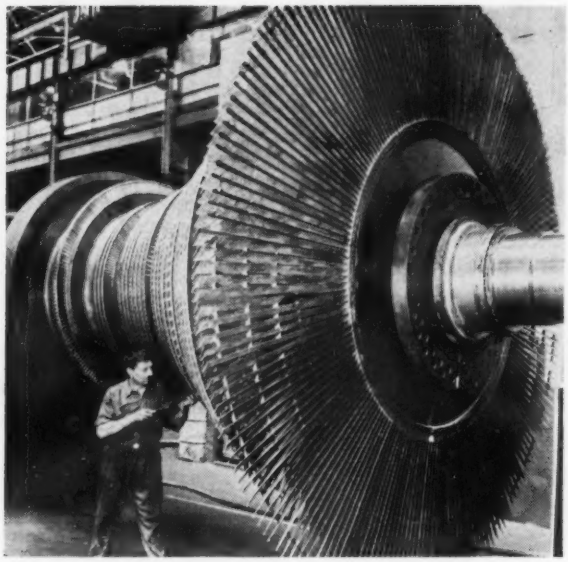
Most serious of all charges is that the Lockland engine plant falsified tests, destroyed records, forged inspectors reports, failed to discard defective material, allowed production officials to over-ride inspection force. The Committee has turned over its files to the Department of Justice and the company and many of its officials are being sued in Federal District Court.

Inspectors Used Judgment

The company denies it all, categorically, and admits that the Committee has documents to prove all its points. But they are all trivial, none of them done in breach of contract or in bad faith. It is again the old question of inspectors using their judgment instead of the letter of specifications. The Truman Committee brought almost identical charges against Carnegie Illinois Steel. The charges were true, but unimportant. Both Navy and Maritime Commission later completely exonorated the company which was merely taking shortcuts that made no difference, to produce more steel. Curtiss-Wright feels sure it will be found innocent. But meanwhile thousands of hours of the most valuable men in the country will be consumed in continued hearings.

U. S. Navy

An Enemy-Eye View—U. S. Army troops stream out of a new and larger LCI (Landing Craft: Infantry) and onto the beach, during practice maneuvers along the Atlantic coast. Notice the shallow draft of the bow of the craft, as evidenced by the soldiers standing waist-deep in water beside it



Quixotian Nightmare — This steam-powered "windmill," shown receiving finishing touches before assembly at the Steam Division of the Westinghouse Electric and Mfg. Co., is to drive a 260-ton generator that will add 100,000 kwh. to the electrical power supply in the war-busy area where it is being installed. Spinning at 1,800 r.p.m., the tips of the longest blades of this huge rotor travel 1,241 f.p.s.

Despite Producers' Efforts, Congress Okays Renegotiation

WASHINGTON—The report of the House Naval Affairs Investigating Committee, before which industry has been expressing its views of renegotiation and urging that changes be made in the act behind it, will not be completed and submitted to the House Ways and Means Committee until after the Congressional recess ends.

Meanwhile, renegotiation of producers goes steadily on in the offices of the Army, Navy, Maritime Commission and Treasury, and will shortly commence on contracts made by the Defense Plant Corp., Defense Supply Corp., Metal Reserve Co. and Rubber Reserve Co. The addition of these RFC agencies' contractors to the field of negotiable insecurities was effected through an amendment to the Military Establishments Appropriation bill.

Added by Executive Order

The War Shipping Administration was recently included by a Presidential order transferring certain functions of the Maritime Commission to that agency.

There has been some talk of placing Department of Agriculture contractors in line for the renegotiation bath, and this is understood to have the approval of the Administration. However, when Congress recessed, nothing had been done about it.

Meanwhile, the addition of four agencies to the squeeze-back of government payments, looks like a legislative approval of the program, and seems to indicate that manufacturers' advocacy of changes in the program is going unheeded.

The arguments of industrialists have varied somewhat, according to the nature of their products and the anticipated postwar market. As pointed out by Joseph L. Trecker, executive vice president, Kearney & Trecker Corp., speaking before the House Naval Affairs Investigating Committee, renegotiation meets with little serious objection from manufacturers of expendable military goods, who will return to a hungry postwar market. But, he continued, manufacturers such as machine tool builders are now busily consuming their postwar market for many years to come.

Trecker Offers Suggestion

Making a concrete suggestion of a plan by which renegotiation can be carried on without undue hardship to machine tool builders, Mr. Trecker suggested that excessive profits be repaid to the government in yearly installments based on the portion of the life of the machine tools consumed in the production of war materiel. Under this plan, on the estimate that a machine tool will last 13 years, the contractor would, during each year the war continues, refund to the government one-thirteenth of the profit previously found to be excessive.

Would Expedite Program

Dismissing all thought of repeal as unthinkable, since it would create an unbalanced situation, Lewis H. Brown, president, Johns-Manville Corp., proposed that the Bureau of Internal Revenue, already intimately acquainted with the figures it would have to deal with, be given entire responsibility for renegotiation. The Bureau examiners, he pointed out, could easily detect those deserving scrutiny by applying the gage of the excess profits tax credit which, in effect, designates immediately all those corporations that have enjoyed profits that might be found excessive.

Mr. Brown's suggestion was based on the deduction that "tentative agreements have been reached with about one-half of one percent" of those holding contracts. "The boards have done their level best, but on the information I have been able to get, it is my guess that the job cannot be done in reasonable time." Slowness of completing the renegotiation program lessens public confidence and makes annual corporation reports worthless, he observed, blaming the unworkable nature of the law for this situation, while praising the renegotiation boards for their ability and devotion.

Urges Allowance of Reserves

Ralph E. Flanders, president, Jones & Lamson Machine Co. and president, Bryant Chucking Grinder Co., appearing before the Naval Affiairs Investigating Committee, stated: The earnings permitted 33 companies making machine tools and allied products, and already renegotiated, "are said to be 25 percent higher than those permitted all other companies renegotiated. That does not reflect the ratio of risk between the machine tool builders and other industries." He based these assertions on data showing widely fluctuating demands that are characteristic of the machine tool market, wherein reserves have been created in good years to cover poor year losses.

While postwar consumer goods manufacturers are prospering on accumulated demand, he pointed out, machine tool builders will be going through a depression due to their having glutted their own market. Mr. Flanders urged that allowances be made for reserves sufficient to meet this condition.

To Boost Number, Work of Labor-Management Groups

WASHINGTON—Plans are underway to develope the work of the 2,000 existing labor-management committees and to establish additional ones in plants still lacking them, according to W. Ellison Chalmers, staff chief, War Production Drive of the WPB.

There is in prospect a much greater extension of production drive work in the field; it will be carried on through the regional WPB offices, as part of a program of decentralization.

The issuance of a regular newspaper covering the work of the labor-management committees is planned.

The steam behind the present drive to pep-up and expand the labor-management committees developed from a meeting of WPB Chairman Donald M. Nelson's Labor-Management Council, which includes presidents F. C. Crawford, National Association of Manufacturers, Eric Johnston, U. S. Chamber of Commerce, Philip Murray, CIO, and William Green, AFL.

INSIDE DETROIT

BY SILER FREEMAN

Phoenix-like, the automotive industry has overed its recent troubles and swung into greater production. New equipment orders will please machine tool builders. Nelson's demand for more is a puzzler. May convert Ford tank factory

Rising from Its Troubles Fighting back from its twin calamities of wildcat strikes and racial rioting, the automotive industry is setting new marks for production which should show in the month's statistics. The much maligned Willow Run, which was well on its way to a new figure for completed planes in June when the double trouble hit it, is now up to a new peak, far beyond what even its best wishers had hoped.

The bomber plant fooled even this observer, after seeing its full-powered activity disrupted by a walkout of foremen. Its June figures were more than 50 percent above the May output and this month will beat June.

Good News For Suppliers Aircraft engines and parts are approaching record marks. There is good news for machine tool manufacturers in the Defense Plant Corporation announcement that Packard was given an additional $16,500,000 last week. The company intends to spend most of the money on new equipment, not only for itself but for its subcontractors.

Packard has had three boosts in its schedules since the first of the year. Early last winter, George T. Christopher, president, announced that Packard would double its 1942 production of Rolls Merlin engines but would not attempt to expand its facilities here.

This policy has been kept to steadily, with the result that production has stepped up without adding too many new workers to the payroll. At the present time, Packard is making only about 1,200 of the major parts of the Rolls engine in its own plants. The other 1,800 are in the hands of competent subcontractors.

The new schedules will probably triple Packard's 1942 output. To make room for this added output, the company has cleared out every available nook and cranny to gain space for new machinery. The last of the automobile manufacturing equipment was put out into the foundry yard last month.

Trainer Engine Output Up Continental Motors aircraft division is also fast stepping up its output of Pratt & Whitney 650's for advance trainers. The division has been producing only since last April and is held back only by lack of sufficient machines. It has converted many machines to fill in the spaces until the new ones are delivered to its lines.

Chevrolet's aircraft engine divisions are almost in the same position. They are on schedule but need many more machine tools.

Nelson Still Not Satisfied Donald Nelson's complaint about production left the automotive industry a trifle puzzled. It has hit almost every goal set for it by the War Production Board and has been forced to cut back many of its projects because of changing strategy.

Tank production was the hardest hit and still is. One production expert estimated that any one of the three big tank arsenals, Chrysler, Ford or General Motors could put out all the medium tanks needed by the Army. There is some talk that the Ford tank plant will be turned over to some new work, probably aircraft parts production.

Specified Smoothness—As a check on instructions for surface polishing and to make sure the engineer and machinist speak the same language when they say "smooth," Jim Whitmyre, General Electric inspector, right, relies on a G.E. surface-roughness gage. Bill Foster, veteran G.E. machinist, left, awaits verdict

Aircraft Groups Show Results With all the emphasis on aircraft, the Central Aircraft Council's two main committees, the engine and airframe production groups have stepped up their activities. These committees are not new, although the Council is of recent origin. Both groups functioned as parts of the Automotive Council for War Production before the Central Council was established on request of Wright Field.

In 15 months, the engine committee has covered 30 subjects of vast importance to the industry, aimed at time, labor and material savings. The topics range from gear shaving and centrifugally cast cylinders to training supervisory personnel. The airframes section has discussed 26 topics, covering such diversified fields as deburring of edges and holes in aluminum to deferment of workers.

Paper Work to Be Simplified Now the Council is attacking another field, which has loomed big in importance to the industry. A committee is working on simplification of forms to stop duplication and cut down the vast number of man-hours necessary to supply all the government agencies with unimportant data.

It was pointed out by a spokesman for the committee that there are 200 forms required of the aircraft industry regularly, 500 occasionally. By going over this paper work carefully, it was found that much of it was being supplied to overlapping departments which could well be dispensed with.

Before this, individual manufacturers were attacking the paper work tangle. Now the Council is planning to unite with the East and West Coast councils to attack it as an industry and try to work out a sensible solution, supplying vital information where needed but not merely sending it reports to be filed in dusty archives.

Carbide Dies Users Offered Training Course by Carboloy

DETROIT—A special training course for users of carbide dies has been put into operation at Carboloy Company, here, to meet the increased need for trained die-room employees resulting from the increase in the use of that company's carbide dies in war production work.

The course is designed both to train new employees of carbide die users and as a "refresher" course for more experienced die service men. It embodies actual shop training in the subjects selected. The curriculum is arranged so that each man may select only the subjects of which are of specific interest in connection with his employment.

The course is available to individuals selected by any user of cemented carbide dies, regardless of make. Individuals selected should preferably be men who fill function in key positions in die service rooms, etc., to enable them in turn to train other men. Each must be a citizen of the U. S. A. The course is conducted without charge. No special equipment is required, although men attending may bring special carbide dies from their mills for actual work training thereon. A minimum of three days is required for each subject.

"Skin" Will Tell—Research Engineer W. E. Young sprays a lacquer coating on a 1600-lb. model of a gear tooth in a hydraulic press at the Westinghouse Research Laboratories. When it dries, the gear tooth is squeezed in the press, capable of exerting a 400,000-lb. grip, and the lacquer "skin" cracks betray vulnerable points of differentially designed gears

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

ALLOY SCRAP—Producers of a total of 5 tons or more of the type designated in the order are required to segregate such scrap into groups listed. (Supplementary Order M-24-c Amended.)

CHAIN—Restrictions have been placed on the manufacture of various types. (Limitation Order L-302.)

ELECTRICAL INDICATORS—Interpretation of "approved order" covering these instruments has been issued with respect to the original order. (Limitation Order L-203.)

FENCE POSTS—Manufacture of steel fence posts has been restricted to those produced from used rails and in accordance with specifications set forth in List 1. (Limitation Order L-211, Schedule 14.)

FLOOR MACHINES—Production restrictions have been placed on floor sanding, finishing and maintenance machines, industrial vacuum cleaners and blowers. (Limitation Order L-222 Amended.)

JEWEL BEARINGS—Use in certain products manufactured for civilian use has been curtailed. (Conservation Order M-50 Amended.)

MACHINE TOOLS—A simpler and more effective method has been established of allocating machine tools to foreign and domestic purchasers, other than those who obtain them through the armed services. Order is also designed to prevent delivery of machines to distributors for stock on a consignment basis. (Preference Order E-1-b amended.)

POWER TRUCKS—Acceptance of orders and deliveries on new and used industrial power trucks have been restricted. (Limitation Order L-112, Amended.)

PURCHASE ORDER REGULATION—Whenever an order or regulation states that a purchase order or delivery order (or document referring to it) must carry an indorsement or certification, the indorsement or certification must be signed, either by hand or in form of rubber stamp or facsimile signature, by party placing order or by duly authorized person. (Priorities Regulation 7, Amended.)

SECOND-HAND MACHINERY—Major revisions which strengthen and expand price control have been announced. Among more substantial changes are provisions affecting rentals of used machine tools and reduction in maximum prices for machine tools not rebuilt. (Maximum Price Regulation 1.)

MACHINES & PARTS—Announcement has been made of withdrawal of limitation on effective period of a provision in the machinery price regulation which permitted wholesalers to adjust maximum prices on certain items if based on lower manufacturer's prices than in effect Oct. 1, 1941. (MPR 136, Amendment 95.)

VALVES & REGULATORS—Explanation of the provision on this equipment clarifies point that end use of the gage or other instrument must be for the account of service branch or agency whose required specifications have been excepted. (Limitation Order L-272, Interpretation 1.)

WELDING EQUIPMENT—Manufacturers of resistance welding equipment are required to file with WPB an operations report on Form WPB-2830 showing orders for new and rebuilt, and equipment (other than portable gun welders and resistance welding electrodes) idle for 90 consecutive days must be registered. (Limitation Order L-298.)

AIEE Holds Elections

CLEVELAND—Nevin E. Funk, vice president in charge of engineering, Philadelphia Electric Co., was elected president of the American Institute of Electrical Engineers for the year beginning August 1, 1943, as announced at the annual meeting of the Institute, here, during its national technical meeting.

The other officers elected were: vice presidents W. E. Wickenden, C. W. Ricker, L. A. Bingham, J. M. Gaylord, and W. J. Gilson. Directors: C. M. Laffoon, C. W. Mier, and S. H. Mortensen. W. I. Slichter was reelected national treasurer.

Offer Electronics Film

EAST PITTSBURGH—"Electronics at Work," an educational motion picture released by Westinghouse Electric and Mfg. Co., explains the six basic functions of electronic tubes and shows how each type of tube is used in some of the latest industrial and military applications.

This 16 mm. sound film is loaned free for showing at war plants and before engineering and technical societies. It may be had by writing department 7-N, Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

Deliveries of ships, resulting from high production in winter and in spring, rose in May and June, while ship construction work fell off. Some civilian goods may be in production by end of year. Antiaircraft battleships considered

New Functions For Battleships You may have read lately about Battleship X which decisively repulsed a swarm of Jap aircraft that attacked it. This battleship was named in print some time back but the rules say that is no excuse for naming it again. At any rate, it was a test case: the battlewagon had a batch of extra antiaircraft guns aboard.

This action has put in the minds of some AEA warriers a new theory of capital ship function; what may be or is being done about it, of course no one will say. A battleship could be studded with so many five inch and smaller guns that no aviation attack could survive anywhere near it. In fact, the big rifles could be taken off of it, and the ship could become a floating antiaircraft fortress serving mainly as a protector of aircraft carriers, which would fend off enemy battleship with torpedo planes.

One thing wrong with this picture is that the Japanese, the world's leading imitator, can do it too.

May-June Ship Deliveries Up The Nation's shipyards delivered 168 cargo vessels totaling 1,676,500 deadweight tons in June, the Maritime Commission has announced. The 31 days of June saw 175 ships skim down the ways, while 30-day April placed 157 in the water. June figures brought total production for the first half of 1943 to 879 ships aggregating 8,818,622 deadweight tons. This exceeds the entire 1942 production of 746 vessels which reach a grand total of 8,089,732 deadweight tons.

1943's 168 vessels include 115 Liberty ships, 19 C-type cargo ships, 9 coastal cargo vessels, 11 M.C. tankers, 3 coastal tankers, 3 special types, 6 sea-going tugs and 2 ore carriers. The West Coast produced 51.94 percent of the national total tonnage; East Coast, 30.39 percent; Gulf Coast, 14.18 percent; Great Lakes, 3.49 percent.

But May Building Shows Decline Talking in terms of value put in place, merchant shipbuilding declined 4 percent in May, though launchings increased 1,800,000 deadweight tons. This would indicate that, several months hence, launchings will decline. Value-put-in-place indices—which are really a construction progress report—are not yet available for the month of June.

TANK CENTER HEAD RETIRES

DETROIT—Brig. Gen. A. R. Glancy has retired as chief of the Army's tank automotive center here and deputy chief of ordnance, due to ill health. He was 62 years old July 17. Gen. Levin H. Campbell, Jr., chief of ordnance, has announced that Brig. Gen. Walter P. Boatwright, now chief of the New York Ordnance District, would succeed General Glancy as tank chief of the automotive center.

Conway Studio *U. S. Army*

Brig. Gen. A. R. Glancy, left, and his successor, Brig. Gen. Walter P. Boatwright.

Won't Curtail Shipbuilding In answer to current talk of a surplus of ships and a shortage of cargo, Lewis W. Douglas, deputy war shipping administrator, said emphatically that the WSA was making every effort to reduce ship time, to save space and to employ every other means of utilizing shipping to the fullest, even to the extent of squeezing and improvising, in order to meet essential demands.

Mr. Douglas cautioned against overoptimism on the shipping outlook because of recent successes in the campaign against U-boats. He said the trend in shipping was generally upward and that every serviceable ton of shipping available to the United Nations would be needed for the duration of the war.

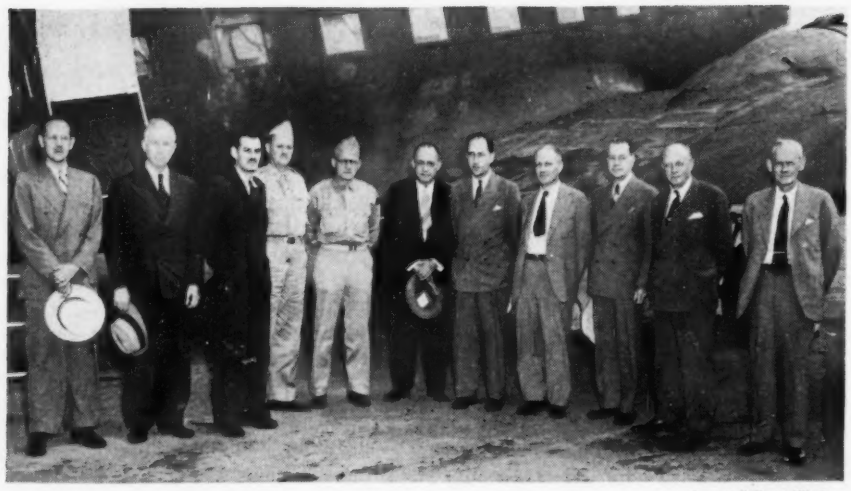
Munition Output Continues Steady Munitions are now being produced at a rate of more than $60,000,000,000 a year and total production for the 12-month period is expected to run beyond $65,000,000,000, according to WPB Chairman Donald M. Nelson's just-released report covering the first five months of 1943. The May production score, as compared with April's was: Total munitions production, no change; aircraft, up 5 percent; ground ordnance, down 3 percent; Navy and Army vessels (value put-in-place), down 4 percent; miscellaneous munitions, down 7 percent.

Production Rate Will Attain Goal Of the four major programs, Mr. Nelson reported merchant ships furthest advanced, with 44 percent of the year's objective estimated as completed by June 30. At the half-year mark, Army ordnance and output of naval vessels and equipment were estimated at approximately 40 percent of the 1943 goals, and the year's aircraft program will be 35 percent completed. Increases in munitions production during the rest of the year must continue at the average rate achieved so far in 1943 to meet the year's requirements.

Close examination of production programs and available materials has made it evident that during the remainder of this year we shall have to draw upon accumulated excess inventories of steel, Mr. Nelson concluded.

To Coordinate Needs, Supplies The War Production Board is making a survey of war needs and supplies on hand in all categories, including ships and airplanes, and undoubtedly there will be large cutbacks in some important items around the end of this year. But the Board proposes to keep our productive capacity rolling at full speed right through the war, turning cutback war order capacities to essential civilian durable goods. Quite a number of household essentials and even some automobiles probably will be manufactured before the end of the war.

Honored for Low Absence Rate In a special citation, labor and management at the Nashville Division, Consolidated Vultee Aircraft Corp. were commended for their low absentee rate by the War Production Board. The Tennessee plant, working 24 hours a day to produce Vengence dive bombers for the United Nations, showed a five months absenteeism average—including all causes—of 2.7 percent, compared to other manufacturers which reported averages as high as 12 percent.



Armored Force Photo

First-Hand View—A group of trade association executives viewed the Army's war machine in Washington, then flew to Ft. Knox to inspect the Armored Force Headquarters. The party included, left to right, above: James C. Ingebretsen, general counsel, U. S. Chamber of Commerce; M. D. Harbaugh, vice president, The Lake Superior Iron Ore Assn.; James Cope, Washington manager, Automotive Council for War Production; Brig. Gen. David G. Barr, chief of staff of the Armored Force; Brig. Gen. Willston B. Palmer, artillery officer for the Armed Force; Newbold C. Goin, executive secretary, American Gear Manufacturers Assn.; Thomas A. Fernley, Jr., executive secretary, American Machine Tool Distributors Assn.; Charles S. Pearce, managing director, Porcelain Enamel Inst.; Harry B. Lindsay, secretary-treasurer, Grinding Wheel Manufacturers Assn.; Herman H. Lind, president, American Inst. of Bolt, Nut and Rivet Manufacturers and Robert E. Belt, executive secretary, Malleable Founders' Soc.

ASTM Annual Meeting Acts on Standards; Discusses Papers

PITTSBURGH—With a registered attendance of 1452 members, committee members, and guests attending the meetings and 245 technical committee meetings, the Forty-Sixth Annual Meeting of the American Society for Testing Materials took important actions on standards and held talks on numerous research investigations.

At the Society's general session, the new president for 1943, Dean Harvey, materials engineer, Westinghouse Electric & Mfg. Co., and Vice President J. R. Townsend, materials standards engineer, Bell Telephone Laboratories, were introduced.

Discussed Keeping Quality

At this session, A. H. Phelps, vice president, Westinghouse Electric & Mfg. Co., spoke on maintaining quality under war-time conditions.

New specifications and tests approved at the meeting number about 50. Notable reports on research involved the work on atmospheric corrosion tests of iron and steel wire and wire products, and on non-ferrous metals, where latest test results of some 24 metals and alloys exposed for years were given. Committee D-20 on plastics during the past year began writing specification requirements with some ten quality standards issued.

Special Lubricant Analyzed And Bulk Made in Three Days

PHILADELPHIA—How an American industry just outstripped every one of its own production records to rush a secret military grease to General Eisenhower and his African forces was revealed last week by officials of Esso Marketers. Nearly 250,000 lb. of the grease, which had never before been made in America and whose ingredients had to be determined by laboratory analysis of a sample shipped from Africa, was made in 96 hours. Shipment was made by truck, train and Army bombers to the embarkation ports.

Production of the grease, likened to "mixing concrete in a cocktail shaker," was made possible by untiring efforts of employees in the Standard Oil Company of New Jersey plants in Baltimore and Pittsburgh. Working continuously for 72 hours, after late delivery of ingredients for the grease, these men kept kettles, motors, belting, and bearings in repair—the stiff consistency of the grease having placed loads on the equipment far beyond that for which it was designed.

Employees Supply Vital Materials

Acknowledgement of the employees' efforts in supplying a vital material in time for the current campaign in the Mediterranian was made at a dinner last week, attended by officials of Esso Marketers, representatives of the Army, and men from the production line. It was revealed that until delivery of the product to the convoy, the question of price was never mentioned by either the Army or the Company.

This grease which is resistant to salt water arrived in North Africa less than three weeks ago. A message was received a few days ago from General Eisenhower, stating "The grease has been received and is doing a satisfactory job."

ASME Nominees Named

LOS ANGELES—Robert M. Gates, president, Air Preheater Corp., has been nominated to be president during 1944 of the American Society of Mechanical Engineers. Election of the nominees will be held by letter ballot of the ASME membership, closing September 28, 1943.

Nominations for vice presidents are David W. R. Morgan, manager, Condenser Pump and Blower Div., Westinghouse Electric and Mfg. Co.; Jonathan A. Noyes, district manager, Sullivan Machinery Co.; Ford L. Wilkinson, Jr., dean of engineering, Speed Scientific School, Univ. of Louisville; and Rudolph F. Gagg, assistant to the general manager, Wright Aeronautical Corp., Paterson, N. J.

Nominated as managers are James M. Robert, dean, College of Engineering, Tulane Univ.; Samuel H. Graf, professor and head of mechanical engineering, Oregon State College; and Alton C. Chick, assistant vice president, Manufacturers Mutual Fire Ins. Company.

Patent Licensing Simplified By Alien Property Custodian

WASHINGTON—In view of the steadily growing demand for licenses under patents seized from enemy owners, Alien Property Custodian Leo T. Crowley has announced liberalized terms for the issuance of licenses to American business by his office.

Beginning August 1, 1943, the fee for obtaining a license to use enemy-owned patents held by the Alien Property Custodian will be a flat $15 for each patent. The new arrangement, Mr. Crowley said, will make it easier for small manufacturers to put single patents promptly to work. Main effect of the change will be to streamline procedures necessary to put seized patents to work in American industry.

Under the new system the class similarity of patents covered by an application will not have to be considered.

Information concerning the 40,000 patents and patent applications now held can be obtained by addressing the Office of Alien Property Custodian, located in the Field Building, Chicago, Illinois.

SPOTTING THE AIR NEWS

Aircraft tonnage up while per plane output levels. North American's P-51 doubles as attack plane. Aircraft War Production Council is forced to show interest in legislation. Curtiss-Wright will expand production of Commando

Aircraft production is on another plateau—the numerical output was about 7000 in May and 7000 in June. Earlier May figures have been corrected downward. The aircraft production board is hoping for 8000 planes in July. The level curve of output is attributed to three causes. One is, of course, the continued and increasing trend to heavier machines. In fact, June output was 5,000,000 pounds over May, which was good. The second cause is continuous design changes. Despite the very intelligent scheme of putting planes through modification centers to save time on assembly lines, manhours and materials are still burned up at about the same rate. People have assumed the enemy is licked and have turned to self-interest and postwar planning, when the main struggle of the war hasn't even started. The third is the let-down.

Lively competition is a mild word for what goes on between makers of the Boeing B-17 and the Consolidated B-24, Fortress and Liberator, this country's team of heavy bombers. Center of contention is comparative range and bomb carrying capacity of the two ships. With an all-gasoline load and no bombs, either one of them can start from New York and go non-stop to a point far out in the Pacific ocean. But with a full load of explosive—enough for a row of ordinary trucks a block long—they can go only a few hundred miles, as you figure out from the fact that they don't hit western Germany. Load vs. range makes plenty of combinations to argue about—plus the fact that one of them uses outboard fuel tanks for long or heavy trips. But the payoff is that the army is seriously considering an order that one of them be built from now on using a large subassembly from the other, and in so doing the one that took the other's assembly would lose its chief distinguishing feature by which it is visually recognized.

New attack plane, the North American A-36, which did beautiful work teaming with the Lockheed P-38 in the destruction of communications and troop concentrations in Sicily, is not really a new plane, as some of the papers said. It is an attack version of the North American P-51 fighter, now generally rated as the finest of its class in the world. An attack plane is usually considered a dive bomber. Air brake flaps and wing racks for bombs were attached to P-51, and some other changes were made to make it an attack plane. With its flaps up and its racks empty it is almost good as the original P-51 as fighter.

Something will be done very soon about a situation the Aircraft War Production Council finds itself in because of its good intentions. By terms of its organization agreement, the council is pledged not to engage in politics—or what is sometimes rudely called lobbying. The old Aeronautical Chamber of Commerce, which was the industry's trade organization, had no such inhibitions, but it has been immobilized for the duration. Now, legislation is proposed in which aircraft manufacturers are vitally interested. Rep. Clarence Lea has a bill which would give the Civil Aeronautics Board exclusive authority to dispose of surplus war planes when peace comes. CAB is an operators agency; the manufacturers have even a bigger stake than the airlines have in the distribution of commercially-usable war planes. There are several other bills providing for the disposal of war plants, some 30 or 40 percent of which are airplane plants. Then there are labor questions in which the council would like to have an advisory voice. Needless to say, the council is going to revise its policy on politics.

Curtiss-Wright Corp. is to expand the production of the giant Curtiss (C-46) Commando troop transport plane, the largest twin-engined airliner type in the world, with the opening of another factory "in Missouri," corporation President G. W. Vaughan has announced.

The Missouri factory already is turning out the new Curtiss A-25 attack-bomber for the U. S. Army Air Forces. Announcement of the expanded production of the Curtiss Commando follows the release of information by the U. S. A. A. F., earlier this year, that a large number of them had landed in India after a record 15,000-mile flight in 4½ days from America via Africa on what it termed "the longest and biggest mass flight in transport history."

To Avoid Acid Skin—So finely machined are the surfaces of oil pump gears that the slight acid exudation in finger prints would etch imperfections into the metal, so men giving the final visual and physical inspection use hand lotion to avoid this

Canada Plans Postwar Program; Aluminum Production Has Risen

OTTAWA—In line with repeated warnings by the federal government that its primary concern for the postwar period is full employment and that if business does not provide it the State will, Canadian National Railways (publicly owned) has developed a plan for expansion and renewal after the war that will mean a lot of business for Canadian steel plants, for manufacturers of rolling stock and their subcontractors.

The CNR plan calls for an expenditure of $640,000,000 in the immediate postwar period. It is estimated that it would provide nearly 100,000,000 man-days of employment. Capital outlay would be divided roughly as follows: $59,500,000 for capital works to extend the operational field of the state-owned transport system; $206,773,000 for self-liquidating projects; $270,000,000 for projects that would be classified as of marginal economic value; $103,500,000 for projects economically unwarranted but otherwise desirable.

CNR officials figure that the system will be able to carry the financial load of the plan if national income does not fall below the current $8 billion level.

Large private enterprise units and trade associations are working on corresponding plans for post-war expansion to provide employment. Business men figure that private business will have to extend itself in this direction as one means of combating political assaults on capitalism after the war.

War Industry Booms

War orders placed with Canadian industry from just before the outbreak of hostilities in 1939 reached a total of just under $9,000,000,000 by June 30. This amount does not include acceptances of tenders and notifications of intention to undertake construction covering proposed outlays running into hundreds of millions of dollars.

Of the total of war contracts placed $4,266,254,051 was on Canadian account alone, which includes plant extensions but does not include about $50,000,000 for airport construction and land purchases for the British Commonwealth air training plan.

United Kingdom commitments in Canada, including those for plant and equipment, amount to $3,702,964,000.

C. E. Wilson, executive vice chairman, War Production Board, tells Lukens Steel Co. workers how a 150 percent increase in shipbuilding during 1943 means steel plants must turn out more plates and fabricated parts. The visit of Mr. Wilson and other WPB executives to Lukens and other plants was part of the "Steel for Victory" drive

Aluminum Production Up

New estimates of 1943 aluminum production in Canada place it at 1,006,000,000 pounds, which is nearly ten times the capacity of pre-war aluminum plants. Output for the last five years in short tons:

1939	.....	82,800
1940	.....	109,200
1941	.....	212,300
1942	.....	335,800
1943	(est.).....	503,000

Canadian output this year will be close to the total of world production in 1937. It amounts to about 40 percent of United Nations requirements and equals, according to estimates, the total output of the Axis.

Canadian users of aluminum obtain it at maximum price advantages, as the escalator clause governing the effective price under British and United States contracts for Canadian aluminum does not apply to domestic sales. Although the base price on outside sales was reduced from the prewar level of 20¢ a pound to 15¢, the escalator provision makes the current effective price 21½¢. The escalated part of the price is adjusted quarterly.

"Steel for Victory" Visits May be Made in Other Areas

WASHINGTON—Inspection trips and employee rallies may be held in other steel producing centers if the recent visit of top-flight WPB executives to Pittsburgh bears the results initial enthusiasm indicate it well may.

During the first two days of this month, WPB Chairman Donald M. Nelson, Executive Vice-Chairman Charles E. Wilson and Vice-Chairman H. G. Batcheller, accompanied by Philip Murray, president, United Steelworkers of America and of the CIO, visited seven Pittsburgh steel mills and spoke before employee rallies at four of them, by way of launching the "Steel for Victory" drive. This is part of an effort to make available 2,000,000 urgently needed tons of steel during the last half of this year.

The plant visits were well received by management and workers alike. They had as their purpose the jacking-up of worker morale and the emphasizing of the necessity of great attention to the war production job at hand. During the ensuing weeks, continuous efforts will be made to keep the drive before the workers.

There are three principal parts of the drive for more steel: Increasing production from existing facilities, through active cooperation of labor-management committees; a "Share the Steel" campaign to be conducted by the twelve WPB regional offices and the Steel Division; a speed-up of the expansion program, to bring into operation ahead of schedule several electric furnaces and open hearths.

NAMES in the NEWS

G. C. Hoyt

G. C. Hoyt has been elected vice president in charge of foreign sales for International Harvester Co., Chicago, agricultural implements, auto trucks, diesel and gasoline engine producers. He succeeds E. A. Brittenham who is retiring after more than 41 years of service with the firm. Mr. Hoyt has been associated with International Harvester since 1916 and has been district manager in charge of the African-Indian sales district as well as director of foreign sales since 1940.

G. M. Williams

George Montague Williams has joined Curtiss-Wright Corp. as a vice president with headquarters in the executive offices in New York City. Mr. Williams was formerly assistant to the chairman of the board of Consolidated-Vultee Aircraft Corp., on leave of absence from Russell Mfg. Co., Middletown, Conn., industrial fiber and fabric makers, of which he is president. In 1917 he became associated with Dayton Wright Airplane Co. and remained until 1922 when he accepted a position as president of the Wire Wheel Corp. of America. Mr. Williams took over the management of Marmon Motor Car Co. in 1924, and in 1934 joined Russell Mfg. Co.

L. J. Rohl has been appointed manager of Carnegie-Illinois Steel Corp., Chicago district metallurgical department, succeeding R. K. Bowden who has been transferred to Pittsburgh as director of quality control, research and technology department. Mr. Rohl has been connected with the organization since 1917 and has been assistant manager in the Chicago office since 1936.

R. W. Gemmell and W. A. Mechesney have been named managers in the recently formed Aviation Section of Westinghouse Electric & Mfg. Co., E. Pittsburgh. Mr. Gemmell will handle engineering problems in the Industry Engineering Dept., while Mr. Mechesney will supervise commercial problems in the Industrial Dept. which involve the application of Westinghouse products to the aviation industry.

Fred J. Wood has been appointed district manager of Jessop Steel Co., Ltd., Toronto. Mr. Wood operated his own manufacturing business from 1919 until 1930, and was a manufacturer's agent for ten years. Before joining the Jessop company's Detroit office in 1942 he was associated with a tool manufacturer.

Henry H. Howard has returned from a wartime post with the United States Ordnance Dept. in Detroit, where he has been serving as consultant to Brig. Gen. J. K. Christmas of the Tank & Combat Vehicle Div., to become general sales manager of Caterpillar Tractor Co. Mr. Howard was manager of the engine sales department of the company when he was called for duties in the War Dept. in 1942.

Harold E. Long, associated with the Nash organization at Kenosha, Wis., since 1917, has been appointed works manager of the Nash-Kelvinator plant in that city.

Ray E. Palmer has been named manager of the Boston office of Aluminum Co. of America to succeed Gordon W. Cameron. He was formerly a salesman in that office.

W. K. Page has resigned as vice president and general manager of Addressograph-Multigraph Corp. to become associated with the Wassell Organization, Westport, Conn., manufacturers of production control and record equipment.

Roy Stephens, executive assistant, and L. H. La Motte, manager of the Washington office, International Business Machines Corp., New York City, have been named vice presidents. Mr. Stephens joined the company in 1913 in the New York sales organization,

Become IBM Vice Presidents

Roy Stephens

L. H. La Motte

and after serving in the first World War he became manager of the Bridgeport, Conn., office. Later he was made manager of the New York sales office. Mr. La Motte has been associated with the firm since 1922 and became general sales manager of the New York office in 1933. He took over the post of manager of the Washington office in 1937. John E. Zollinger, previously manager of the Cleveland office of IBM has been appointed eastern sales manager.

F. W. McIntyre, vice president and general manager, Reed-Prentice Corp., manufacturers of machine tools, Worcester, Mass., has returned to this country to resume active management of the company. He has been on leave of absence for four months, during which time he engaged as lend-lease consultant for machine tools in Australia.

Resumes Post at Reed-Prentice

F. W. McIntyre

Joseph Slepian, associate director of Westinghouse Electric & Mfg. Co. research laboratories, E. Pittsburgh, has been awarded the Lamme Medal which is presented annually by the A.I.E.E. for meritorious achievements in development of electrical apparatus or machinery. Dr. Slepian was chosen as the fourteenth winner of this medal for his contributions to the development of current interrupting and current rectifying apparatus. He developed the Ignitron tube.

E. Nuber has been named manager of the Pacific Coast branch office and factory of the Bristol Co., makers of recording, indicating and control instruments, located in San Francisco.

T. H. Pickering, manager of the Batavia, N. Y., plant of Doehler Die Casting Co., has left for New York City to take over an executive position at the company's headquarters. He has been succeeded by William G. Gutmueller, who was manager of the Pottstown, Pa., plant.

Harry L. Smith has been made vice president and general sales manager of Kelite Products, Inc., Los Angeles. Mr. Smith formerly visited plants throughout the country as a "trouble

shooter" where new or difficult cleaning problems were encountered.

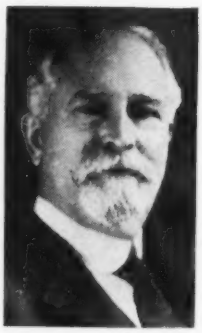
J. S. Longdon, sales manager, and Frank J. Schwab, factory equipment manager, of Lempco Products, makers of hydraulic presses, grinders, and auto parts, have been promoted to the positions of vice presidents. Mr. Longdon has been with the organization ten years as sales representative, territory sales manager and assistant sales manager, while Mr. Schwab has been associated with Lempco 15 years in various executive capacities.

Lempco Vice Presidents

F. J. Schwab

J. S. Longdon

OBITUARIES



Jas. E. Mac Murray

James E. Mac Murray, founder and former chairman of the board of Acme Steel Co., Chicago, manufacturers of strip steel, box strappings and hoops, passed away at Pasadena, Calif., at the age of 80. Mr. Mac Murray held the presidency of the company, developed from a small enterprise, for 38 years and then became chairman of the board until his retirement several years ago. He had served as Illinois State senator for six years.

Zechariah Chafee, 84, died at his farm at Taunton, Mass. Mr. Chafee had been president since 1889 of Builders Iron Foundry, Providence, R. I., producer of surface grinding machinery, metering and controlling equipment and grey iron castings. He served continuously as a trustee or fellow of Brown University and as a member of its executive and advisory committees. From 1887 to 1897 Mr. Chafee was connected with Brown & Sharpe Mfg. Co. of Providence, makers of machine tools, having been at one time secretary of the company. For many years he was interested also in the Barstow Stove Co., and built up the grinder line later sold to Diamond Machine Co.

Frank L. Cross, 72, inventor of the Cross automatic feeder for printing presses and folding machines, died at his home in Port Washington, Long Island, after an illness of about five weeks. In the early part of the century he aided Thomas Briggs in the development of the Boston wire stitching machine, and while with the Standard Machinery Co., Mystic, Conn., Mr. Cross helped build an early model of an automatic pile feeder for printing presses. In 1905 he joined the late H. A. Phinney in organizing a company in Boston for making automatic paper feeders, and served as chief engineer until 1938 when the firm was purchased by the Dexter Folder Co. of New York.

Frederick Payne Weston, 72, formerly president of the Torrington Co., Torrington, Conn., makers of ball bearings, swaging machinery, small metal specialties, passed away in that city recently.

Washington Appointments

Smaller War Plants Corp.:

Truman P. Handy, deputy chairman.

WPB, Miscellaneous:

George O. Rowland, chief, Industrial Brush Unit; Theodore K. Quinn, director general, War Production Drive, started in 1942 to promote labor management cooperation on war production through establishment of joint committees; John C. Whitridge, Jr., director Office of Industry Advisory Committees succeeding Barry T. Leithead; Arthur H. Bunker, chairman, Aircraft Aluminum Products Control Committee, charged with responsibility for increased production of essential aluminum forms and their equitable distribution among aircraft manufacturers.

Bachrach

JOHN T. WHITING
President, Alan Wood Steel Co.
New Director WPB Steel Div.

BUSINESS ITEMS

Tri-State Tool & Gauge Co., Detroit, has been formed by Gilbert C. Guydos. For the past 18 years he has been engaged in the aircraft industry in connection with the making of jigs, fixtures and tools. Mr. Guydos has been associated with Lockheed, Vega, Consolidated, North American and Vultee.

Duro Mfg. Co., Los Angeles, has announced change of its name to Benchmaster Mfg. Co. The firm makes precision bench machine tools, power punch presses, vertical and horizontal milling machines, rotary tables and vises.

Sam Tour & Co., New York City, has taken over the metallurgical laboratories of Lucius Pitkin Inc. in that city and will handle the work as consultants, engineers, metallurgists, metallographers, radiographers, research development and testing laboratories for the clients previously served by the discontinued departments of Lucius Pitkin Inc. That company will continue as analysts, assayers, chemists, consultants spectroscopists catering to the metallurgical and mining industries. Alexander Gobus, formerly metallurgist for Doehler Die Casting Co. and for American Car & Foundry Co., and for the past five years chief metallurgist for Pitkin, and other members of the Pitkin Engineering Staff have become associated with the Tour Company.

Brady-Penrod, Inc., manufacturers of coolant and circulatory pumps for machine tool use, has opened a branch office and factory at 1945 Santa Fe Ave., Los Angeles, with L. D. Ashe as general manager.

Siewek Tool Co., Ferndale, Mich., maker of cutting tools, has been purchased by Domestic Industries, Inc., of Chicago. Two affiliated companies, Siewek Tool & Engineering Co., Hartford, Conn., and Progressive Tool & Cutter Co., Ferndale, have been included in the acquisition. Siewek Tool Co. and Progressive Tool & Cutter Co. will operate as the Siewek Tool Div. of Domestic Industries, Inc., while Siewek Engineering Co. will be known as the Siewek Engineering Div. Stephen L. Meszaros is general manager of both divisions and N. J. Holt continues as manager of the Hartford branch.

MEETINGS

Silver Bay Industrial Conference. Annual meeting. Silver Bay, N. Y., July 28-31.

Society of Automotive Engineers. Aircraft Engineering & Production meeting. Biltmore Hotel, Los Angeles, Calif. Sept. 30-Oct. 2.

SHOP EQUIPMENT NEWS

Dayton Rogers Piercing Press Is a Self-Contained Unit

Dayton Rogers Manufacturing Co., 2835 12 Ave., S., Minneapolis, Minn., has developed and is using an automatic electric piercing press which will be available commercially after the duration. The press is made in two sizes, with a throat capacity from 12 to 14 in., and a maximum weight of 15 tons. The slide stroke is 1¾ in., with a ram adjustment of 2 in. The presses are provided with a shunt height for die space of 2 to 3 in. Each press is completely self-contained and individually motor driven.

With these piercing presses it is said to be possible to change the hole size and location of hole in a given group of pierced blanks to any size and location required with the minimum cost. These hole sizes in the pierced blanks can be produced of any size from 0.015 to 1⅛ in., progressing by 0.001, and the presses are so arranged that these hole sizes and locating holes can be changed on one group of blanks to another without disturbing production capacity of the presses.

The ram movement is carried at the bottom or bolster side of the press, the punch on the upper section. The ram also carries the die. The flywheel has an electric clutch with automatic releasing brake built into the base of the machine. Each machine is provided with its own working guard and when it is necessary for the operator to change the tools by removing the guard on such operations, the guard trips automatically and throws the power switch of the individual press.

Each machine has a special cushion stripping mechanism carried in the head or on the punch side of the press. The automatic trip is so arranged that when the work is in correct point for operation, the machine automatically goes through the required working cycle and is then locked out until the next piece is put in correct position. With this automatic safety feature it is possible for the operator to operate the machine to its maximum production with complete protection.

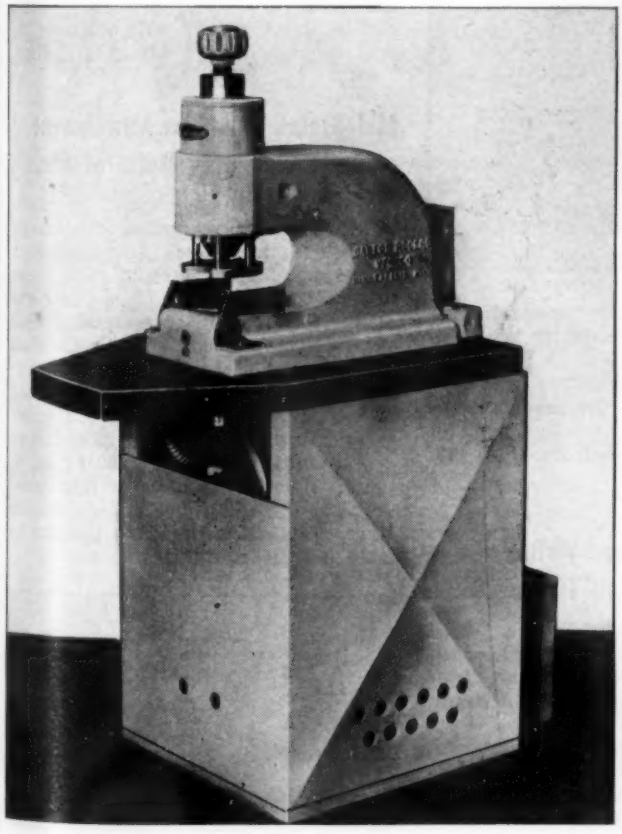
Jones Neo-Film Liquid Coating Protects Hands From Dermatitis

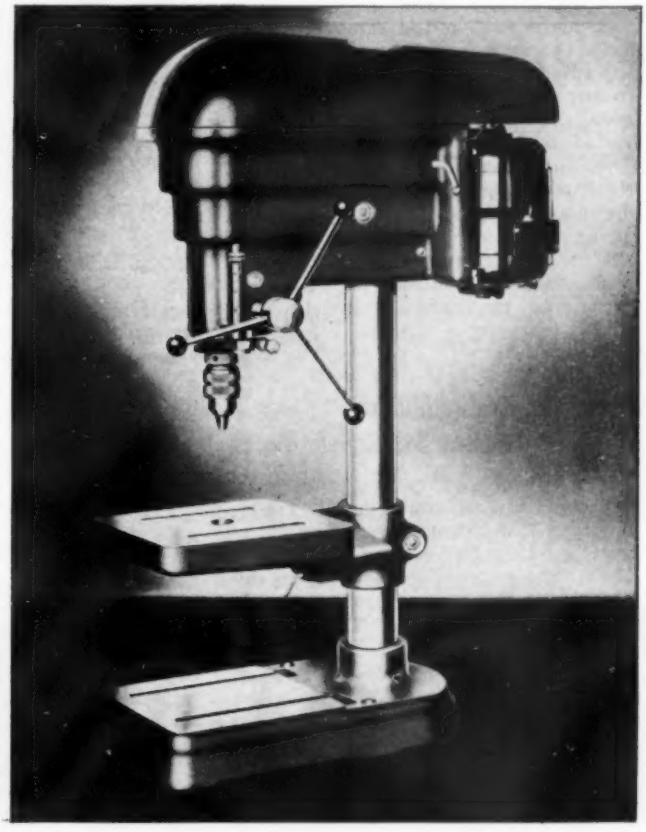
Neo-Film, a protective coating to prevent industrial dermatitis, has been introduced by Jones Medical Laboratory, Inc., 800 Huron Rd., Cleveland, Ohio. It comes in a liquid form, dries rapidly, and serves to protect against the action of cutting oils, many chemicals, solvents, and fumes on the skin. Neo-Film is oilproof and antiseptic, and washes off with soap and water. It is available in 2, 8 and 16 oz. bottles.

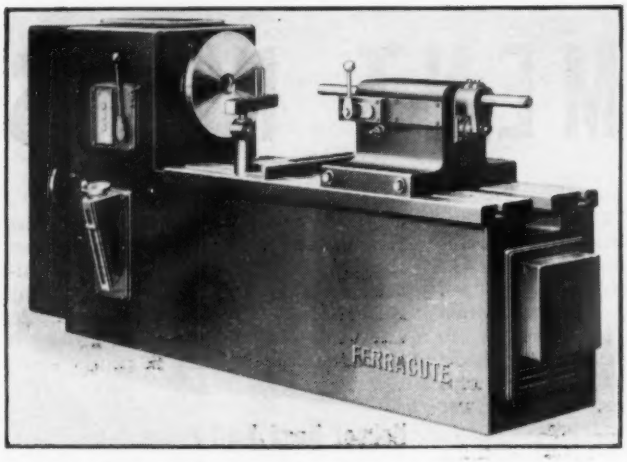
Helmet Head Drill Press Has Self-Centering Spline

One, two, three or four spindle types of the Helmet Head drill press are offered by Boice-Crane Co., 935 Central Ave., Toledo, Ohio. A feature of the machine is the self-centering 30-deg. pressure angle six-tooth involute spline. Both high and slow speeds are available, and the table can be furnished in the slotted or trough type. The press is vibrationless and working parts are sealed. The spindle, quill, and spindle-pulley are held in permanent, true alignment. The quill is held by three bearings, permitting long holes to be drilled more accurately. Five predetermined speeds allow for every operation of this drill press.

Tapping machines designed for the Helmet Head operate at 3,000 r.p.m. "in" and 6,000 r.p.m. "out". They can be furnished in two sizes.







Ferracute Spinning Lathe Has Air-Operated Tailstock Spindle

Ferracute Machine Co., Bridgeton, N. J., has developed the Model 224 spinning lathe designed to save production time in such standard operations as spinning, buffing, burnishing, trimming, wiring and beading. The maximum swing over the bed is 24 in., and distance between the open centers is 48 in. High and low speeds are available with infinite selection between 200 and 500 r.p.m. in low and 400 and 1,000 r.p.m. in high. The 5-hp. motor operates on 220-440 volts, 60-cycle, 3-phase.

For instantaneous starting and stopping a single-lever control of the cup and brake are provided. Air is employed to move the tailstock spindle. One spindle-operating lever for right hand control is moved toward the work and the spindle travels forward. Further movement in the same direction locks the spindle. Maximum travel of the spindle is 12 in., and it can be set to any length within this range. The speed of positioning the spindle is adjusted by means of a control valve. The hollow spindle has a standard No. 3 Morse taper. The tailstock casting is easily moved and firmly clamped at any desired position on the bed. The headstock spindle is hollow with a standard No. 3 Morse taper. Lubrication is by pressure grease gun through accessible fittings.

Thompson Profile Miller Handles Odd Shaped Parts

Irregularly shaped parts can be produced on the automatic profile miller, made by E. A. Thompson Manufacturing Co., 1300 Hilton Road, Ferndale, Mich. The entire machine with an exception of the loading and unloading operation is automatic. The head is adjustable to 0.001 in.

The cutter spindle is mounted on precision Timken bearings within the quill. The quill has a silent chain drive and hardened, helical chain gears running in oil and has 6-in. precision vertical adjustment. The spindle nose has a standard No. 40 taper. Selective speed of the spindle ranges from 127 to 3,435 r.p.m.

The work is carried on a 14-in. rotating table which is hydraulically controlled by a simple cam and follower mechanism. A ground center hole in the table facilitates positioning of work-holding fixtures. To meet the

requirements of a wide range of work, two program disks determine rapid indexing cycles and automatic table stop. A pressure and gravity lubrication system is built into the machine. All working parts are fully inclosed for safety and protection from chips and dirt.

Post Makes Improved Whitex White Pencil Tracing Cloth

The Whitex improved white pencil tracing cloth, offered by Frederick Post Co., Box 803, Chicago, Ill., is moisture-resistant on both sides. The fine-tooth surface of this cloth provides a jet black pencil line, and the glass-like transparency is said to produce prints that are etching sharp. Whitex offers protection from climatic conditions.

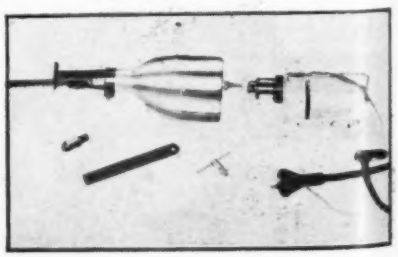
Ransome Welding Positioner Made in Hand and Motor Models

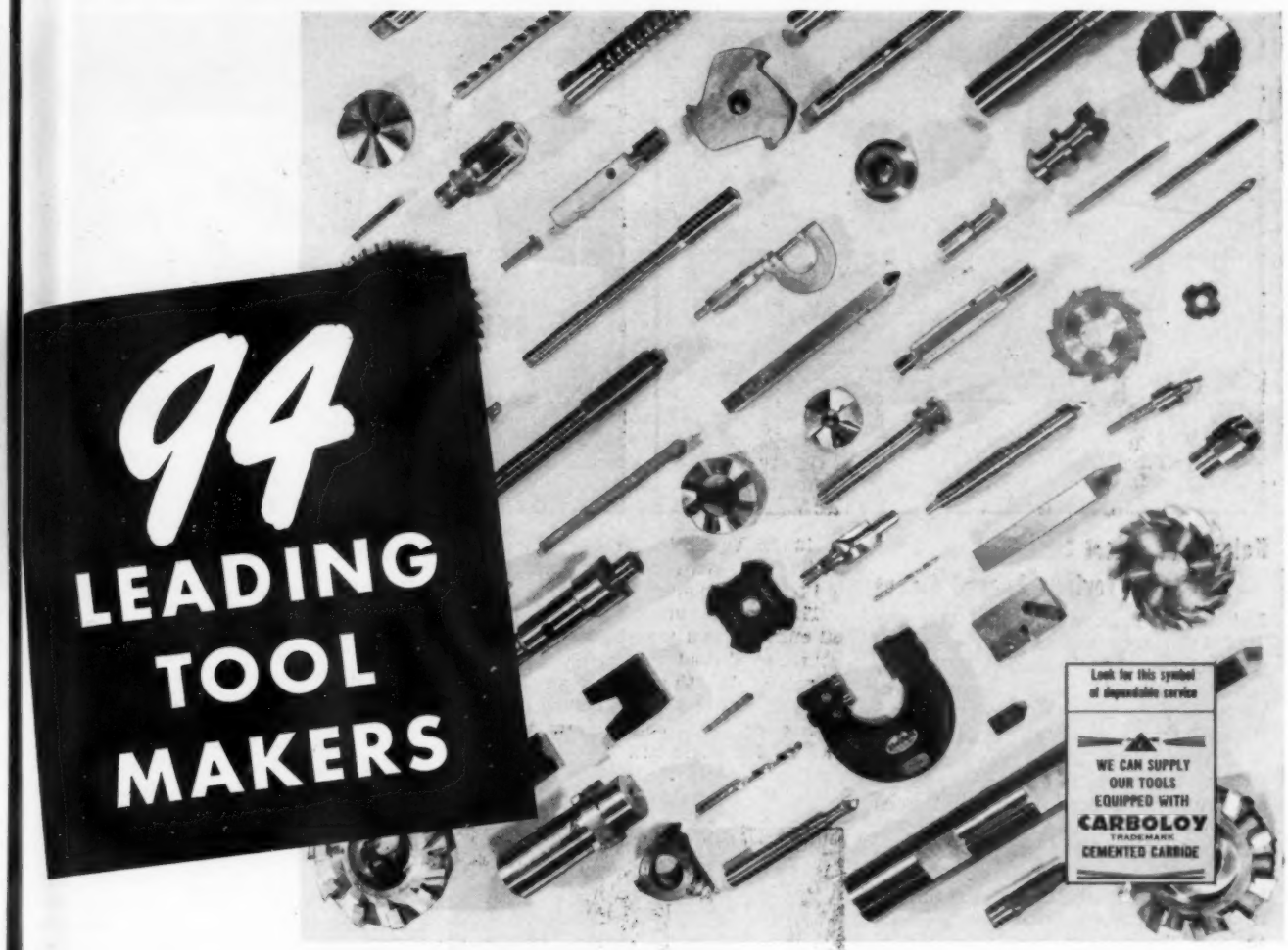
A 500-lb. capacity welding positioner available in hand or motor operated models, has been introduced by Ransome Machinery Co., Dunellen, N. J. It is designed to handle loads with the center of gravity of load 6 in. away from the table top and with a 6-in. eccentricity. The 26-in. diameter circular table top is T-slotted. A clutch arrangement permits free rotation of the table top by hand when required.

The motorized unit includes a Reeves drive which provides a speed range of up to 1 r.p.m. of the table top. The tilting range is a full 135 deg. from horizontal or 45 deg. beyond vertical. The machine can be furnished with a regular base for bench work, or with a sub-base giving a height adjustment from 27 to 42 in. from the floor line to the table top. The motorized units can be supplied with a handwheel instead of a motor for tilting if desired.

Mid-States Saw-Gun Attachment Will Notch Metal or Plastic

Many hours can be saved on panel notching, slotting, or other fabricating operations in plastics, stainless steel, monel metal, corrugated or plain steels in heavy gages by use of the saw-gun attachment for an electric drill, flexible shaft or compressed air line, which has been developed by Mid-States Equipment Co., Saw-Gun Div., 2429 South Michigan Ave., Chicago, Ill. The attachment is recommended for use on a drill with a speed of 2,000 r.p.m., or more. It will cut directly into wood or plastic without drilling a hole to start, and will saw or file plastics or metal in places difficult to reach.





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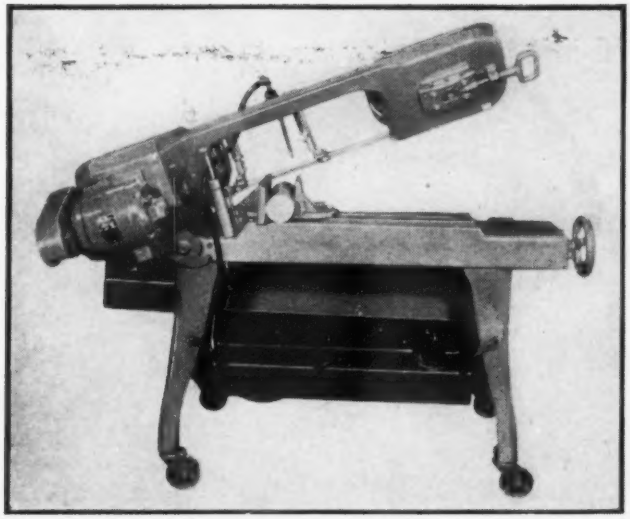
Are you using Carboloy Training Films for employees handling carbide tools? Set of six 35 mm silent slide films on manufacture, design, application and maintenance of carbide tools available for your permanent use at print cost of $20.00.

CARBOLOY TRADEMARK **CEMENTED CARBIDES**



Kalamazoo Metal Cutting Saw Handles Various Shaped Pieces

Kalamazoo Tank & Silo Co., Machine Tool Div., Kalamazoo, Mich., has developed a metal cutting bandsaw equipped with a coolant system. No pump priming is required for the centrifugal type pump. The pump motor is located outside of the pan for accessibility and protection from the coolant, and is designed for continuous operation. It operates on 110-120 volts, single phase, 50-60 cycle. For controlling the flow of the coolant a valve is provided which can be regulated from a slow drip to a fast washing action. The flexible metal nozzle permits placing the coolant at any angle. The feed line is made of flexible extruded plastic tubing, resistant to caustics, oil and chemicals, and nonkinking. Control valve and flexible nozzle are attached to the bracket mounted on the guide frame.

This bandsaw does continuous cutting of round, square, solid, hollow and irregular pieces. The machine occupies a floor space 25×65 in., is 26 in. high to the top of the bed, and weighs 600 lb. It has the capacity for 8 in. round or 8×16 in. flat stock. At slow speed this machine will cut 85 ft. per min., 110 ft. at middle speed, and 160 ft. at high speed. It is equipped with ½ hp. a.c. ball bearing motor, and occupies a floor space 25×65 in., is 26 in. high to the top of the bed.

The extra capacity saw will handle 8×24 in. flat stock, and is equipped with a ¾-hp. motor. The machine may be mounted on casters if desired, making it entirely mobile.

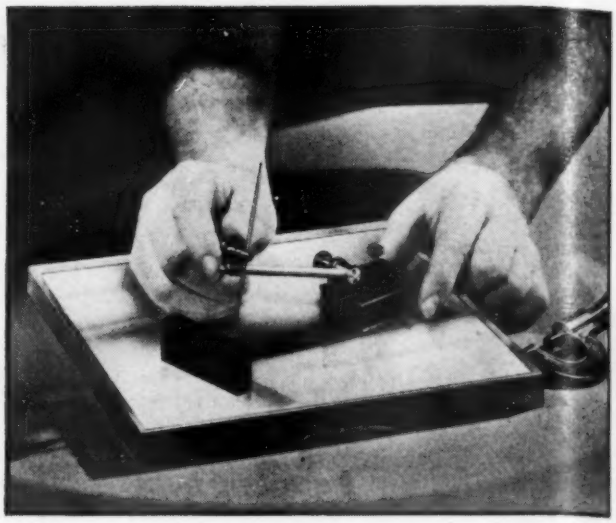
Very little heat is generated during the cutting operation, and the blade remains cool at all times, and requires no attention during performance. The gravity feed is cut off by an automatic stop switch. Very thin cuts can be made to the full width of the throat, with only a variation of a few thousandths in thickness. Since only the cutting portion of the blade is exposed, the operator is protected. The moving wheels or parts are entirely inclosed. The blade size of the standard model is 10 ft. by ¾ in. by 0.032 in. thick, while the extra capacity model uses a 12-ft. saw blade.

The frame descends slowly on an oil cushion, and may be stopped at any point or slowed in travel by closing a valve. By throwing a small lever, the vise can be used either as a quick-acting or as a solid screw vise. It swivels for angle cut.

Eye Savers Safety Goggles Have Full-Protection Frame

The Eye Savers industrial safety goggle which is being offered by Watchemoket Optical Co., Providence, R. I., has Plexiglas lenses. The material is clear and is said not to shatter or splinter under impact. They can be easily removed for cleaning or replacement. The goggles are plastic, weigh 1¾ oz. and fit over prescription glasses.

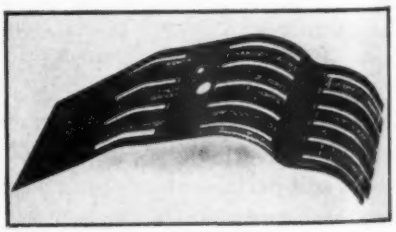
A full frame provides added protection against injury from the side, top and bottom. It is reinforced with a metal clip at the bridge, and amply ventilated to prevent fogging. Snap-in filters are available for torch welding or cutting and other glares.



Cadillac Glass Surface Plate Available in Seven Sizes

Cadillac Glass Co., 920 West Cermak Road, Chicago, Ill., has produced a glass surface plate. It is said that with the low coefficient of expansion of glass, temperature changes have no appreciable effect on the accuracy of the surface plate, and being a nonconductor of electricity, the plate does not require demagnetizing. Since glass is non-corrosive, it is not necessary to coat the surface with oil when not in use. Acid used in the average plant does not affect it. This plate retains its original accuracy unless scratches on it are deep and densely grouped. The clear, polished surfaces permit the placing of data or drawings beneath the plate for ready reference as well as protecting them against damage.

The plates are available in seven sizes, ranging from 8×8 in. to 18×18 in., having four degrees of accuracy: 0.0002, 0.0003, 0.0004 and 0.0005 in. They are packed in individual wooden boxes, the top of which forms a protecting cover.



Moss Fabricates Plastic Into Curved-Shape Panels

A method of fabricating plastic into cylindrical shapes and compound curves at low initial costs has been developed by Theodore Moss Co., 33 Flatbush Ave., Brooklyn, N. Y. A typical example of the method is the airplane panel illustrated. The panel is accurately machined to accommodate levers and knobs, measures 27×7¾ in., and bears data in depressed white enameled letters legible against the black panel.

TODAY copper fights on the global fronts

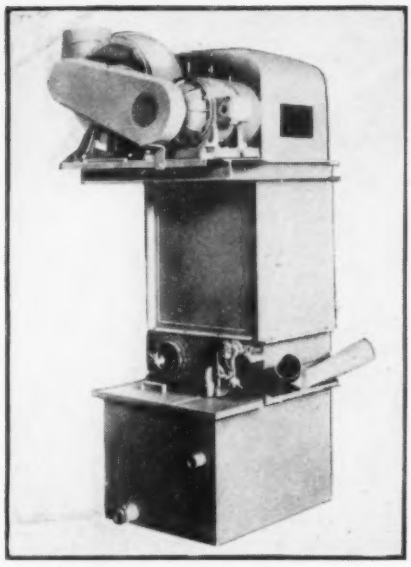
Today the copper industry is working all-out to win the war. No copper is available for anything else. But post-war planners with specific problems in metals are referred directly to the Revere Executive Offices in New York.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

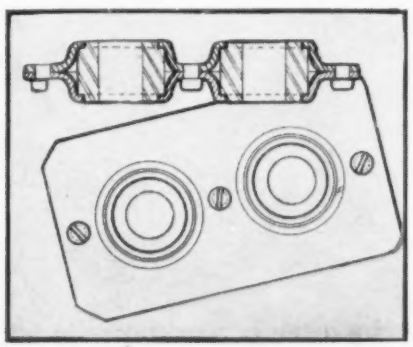
Executive Offices: 230 Park Avenue, New York



Industrial Makes Orifice Type Dust Collector in Small Size

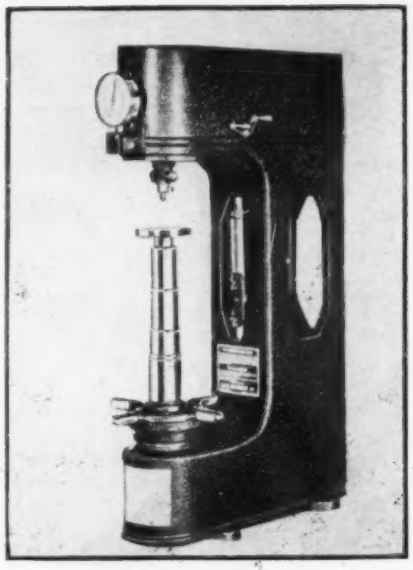
Industrial Equipment Corp., 6435 Hamilton, Detroit, Mich., has available a small sized dust collector of the orifice type. It has a capacity of 1,200 cu. ft. per min., and has been built to meet the requirements of the double-spindle grinding and buffing lathes, although it is adaptable to many other kinds of work.

It is particularly suited in work with magnesium. The cleaning action is caused by the scientifically directed movement of air through an orifice. A compartment at the side collects the sludge and permits its easy removal. The water level is controlled by a specially constructed diaphragm valve.



Northern Gage Holder Applies Axial Pressure

A twin ring gage holder has been developed by Northern Tool & Die Co., 330 North Albany Ave., Chicago, Ill. This holder accommodates ring sizes having an outside diameter of 11/32, 21/32, 1¼ and 1 17/32 in., and shoulder diameters of 7/16, ¾, 1⅝ and 1⅝ in. Axial pressure, instead of radial, holds the rings firmly without danger of distortion. The holder is made from stamped steel and is light in weight.



Clark Hardness Tester Supplied in Three Models

For Rockwell testing, Clark Instrument, Inc., 10300 Ford Road, Dearborn, Mich., is making an improved hardness tester in three models, US8, US12 and US16. Among the features of this tester are: A frictionless spindle to provide a correct minor load at all times, zero drag trip for eliminating friction or drag on the loading beam, a dial indicator adjustment and a minor load adjustment.

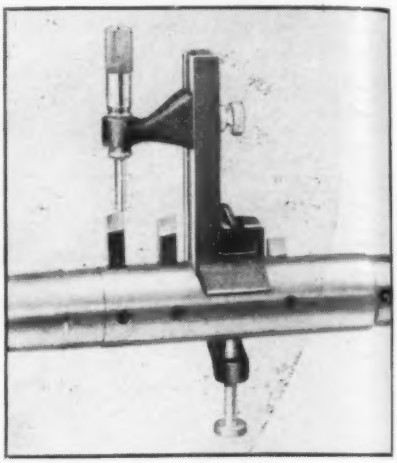
The instrument has a fully inclosed elevating screw with a self-lubricating oil reservoir and an adjustable steadyrest. It has a diamond cone penetrator and steel ball penetrators for Rockwell testing on B and C scales as well as most other Rockwell scales. Three anvils are supplied; a 3½ in. anvil for large work, a spot anvil for most standard size pieces and blocks, and a V-anvil for testing round and cylindrical parts. These are in addition to the two smaller V-anvils that are part of the adjustable steadyrest.

Bartelt Pedestal Micrometer Will Serve Many Gaging Uses

Although designed for setting closely spaced boring tools quickly, the Model B pedestal micrometer made by Bartelt Engineering Co., 1412 Partridge Ave., Beloit, Wis., is also useful for a number of other gaging purposes. The gage consists of a pedestal with a base that has a wide V opening and flat surfaces at the ends of the extensions. It can be placed on a boring bar where it is held by a removable clamp which engages a slot in the top of the base. The flat surfaces enable the gage to be placed on a surface plate, a machine bed or any other plane surface. An arm which carries the micrometer head is clamped to the vertical surface with a screw through a slot in the upright. Because the pedestal is doublefaced, this arm may be clamped to either side as desired, and can be changed from one side to the other without changing the clamped position of the pedestal. Boring tools placed 3½ in. apart can be set without changing the pedestal by simply clamping the micrometer head one side and then on the other.

The arm has a ground foot and carries a standard micrometer head. A dial indicator reading to thousandths or tenths may be substituted for the micrometer.

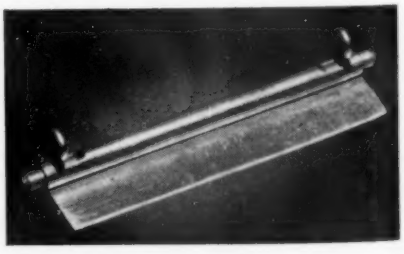
All surfaces, except those which are ground or polished, are finished in black crackle. Three clamps are furnished to fit all size boring bars from



1 to 5 in. diameter. The flat portion of the base permits the pedestal micrometer to be used as a height gage, as a depth gage, for other machine set-ups, and for inspection work.

Burklyn Quick-Release Hinge Has Application on Machines

A quick-release hinge, originally developed by Burklyn Co., 3429 Glendale Blvd., Los Angeles, Calif., to replace former methods of releasing ammunition chutes on aircraft machine guns, has found application on machine tools, generator housings and automotive equipment, among many other uses for quick and easy removal of a door,



table, hood, and the like. The unit is composed of a bracket which houses spring-loaded attaching pins that are equipped with finger pads to retract the pins. When the pads are forced together, which can be done from any position, the hinged part is entirely free. Models are available in several bracket designs in lengths 2 to 6 in.

Quaker Research now makes it practical to

CLEAN AND RUSTPROOF

in one operation!

LONG BEFORE THE URGENCY of war production and manpower shortages gave such added importance to the elimination of production operations wherever possible, we at Quaker Chemical were at work on the development of a water-emulsifiable solvent which would not only provide thorough metal cleaning, but would also afford effective temporary rustproofing . . . all in one operation!

Beginning with the idea of displacing alkali cleaning and straight solvent degreasing with a new process, our Research Laboratory tackled the problem of harnessing the effectiveness of solvents with water and mechanical power.

During the past ten years this development work has progressed—both in the laboratory and in actual production usage—until, today, there is available a complete line of QUAKER QUASOLS . . . water emulsifiable solvents in liquid form.

COMBINES SOLVENT & MECHANICAL ACTION

Used in the proportion of 1 gallon of QUASOL to approximately 50 gallons of water, in washing machines run at no higher than 140°F., the solution removes greases, dirt, soaps and inert materials from metal parts by a combination of solvent, thermal and chemical action.

Dirt and oil float to the surface of the solution and are easily removed in the skimming tank of the washing machine. In this way the cleaning solution is always kept free of grease and, with occasional additions to compensate for drag-out, will continue to provide good results almost indefinitely.

LEAVES RUST-PREVENTING FILM

In addition to its effective cleaning properties, the emulsifiable solvent leaves on the work an imperceptible coating that prevents rust for a period of from two weeks to six months (depending upon the concentration used). Thus it protects from rusting any metal parts held over for short periods on conveyor lines or in stock.

So, if you are interested in a metal cleaning process which provides rapid, thorough cleaning at low cost . . . leaves an excellent surface for finishing and coating operations . . . with no alkali film on the work . . . and no rust—we suggest that you call in a *Quaker Process Engineer*. Let him analyze your requirements and recommend the correct type of QUAKER QUASOL to produce the results you want.

QUAKER PROCESS ENGINEER KNOWS YOUR PRODUCTION PROBLEMS

You'll find the Quaker Process Engineer a graduate engineer or chemist . . . intimately acquainted with your production problems through years of personal experience . . . and thoroughly trained in the application of Quaker's many new type products for the metal working field. He'll gladly share with you his knowledge of metal cleaning, rustproofing, cutting, grinding, and almost any other process in metal manufacture—whether served by Quaker Chemical products or not. Simply write, wire or phone—

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT . . . . Warehouse Stocks in Principal Industrial Centers

Flex-Abrasive Line of Wheels And Points Are Self-Dressing

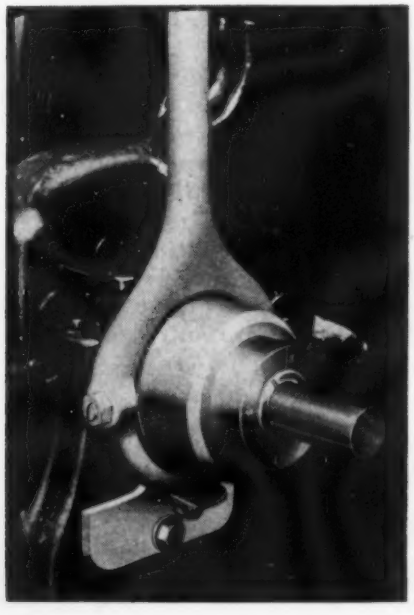
A line of abrasive wheels and micro points has been introduced by Flex-Abrasive Co., 100 North La Salle St., Chicago, Ill., made from wear-resisting abrasive material in all grits from the coarsest to the finest. These wheels and points are self-dressing and are suited to deburr exterior edges and finish irregular surfaces of hard alloy steels, wood, rubber, resin and plastics usually hard to get at, as well as to cut, grind, finish and polish these materials.

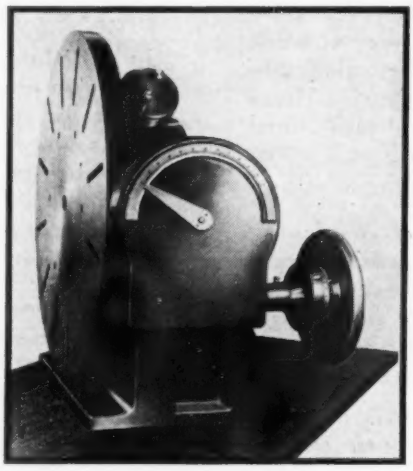
The mandrels are of tapered thread construction, firmly locking the abrasive wheel or point to the shaft by rotary motion. The wheels and points can be quickly removed or replaced from the mandrel without the use of tools, nuts, split shafts or grommets.

Hall Introduces Collect Chucks That Operate by Hand Touch

The Model A collect chuck, brought out by Hall Manufacturing Company, 622 Tularosa Drive, Los Angeles, Calif., fits all lathes with 1½ in. 8-thread spindles and the Model B fits 1¾ in. spindles. The chuck has no latches, fingers, cams, dogs or irregular parts. It is operated by a slap of the hand to lock or unlock the chuck without stopping the lathe. This is a "push out" type chuck, pushing the stock against the stop so that length accuracy is obtained.

The design of this chuck eliminates the need for thrust bearings. No friction or heat are generated because all parts turn at spindle speed. Bar stock varying from standard size is tightly held by automatic adjustment of the pressure on the collet. Accurate mounting is obtained by an adapter that is cut running true on the lathe spindle on which it is to run. Installation is made on any lathe quickly, and only the fulcrum of the locking arm needs to be bolted to the lathe.





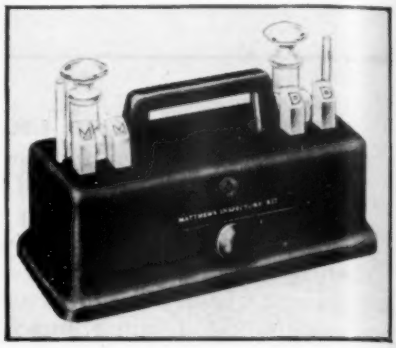
Rotab Holds Large Pieces For Machining and Measuring

For machining and measuring large pieces such as fixtures, castings, patterns or fabricated parts, Machine Products Corp., Detroit, Mich., has introduced the Rotab. It has a 36-in. circular table on which the work to be measured may be clamped, and all angles on the work may be inspected without disturbing the original clamping. The over-all height from the top of the table in its horizontal position is 27⅝ in. and base measurements are 20½ × 27 in. The unit weighs 1,400 lb.

By means of geared turning wheels the table can be rotated to any degree and any angle from the vertical to the horizontal position, and then 30 deg. below in the opposite direction. The table can be locked in a fixed position, radial or angular, during the checking of measurements. It may also be disengaged to rotate freely by hand. Dials showing the degree and minute graduations register the angle of setting. The equipment also provides a 10-in. sine bar for use where greater accuracy is required. An auxiliary table 18⅞ in. in diameter is provided for the 36-in. plate if needed for smaller work.

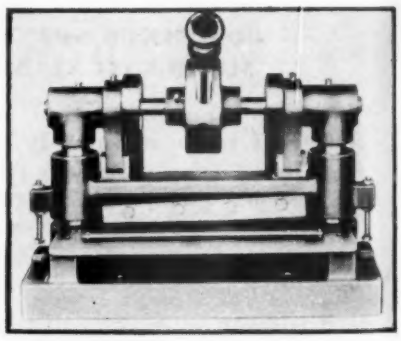
Matthews Inspector's Kit Holds S-22 Synthetic Stamps

A streamlined, compact inspector's kit for use in marking etched duplications on steel parts has been developed by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa., for its S-22 synthetic stamps. The kit is made of acidproof material, and holds four stamps, or more if desired. The acid etching ink is kept in one bottle and the oil or neutralizer in the other. A drawer at the front of the unit holds



the stamp pad. The drawer is easily pulled out for re-inking the pad by means of a glass tube which is provided.

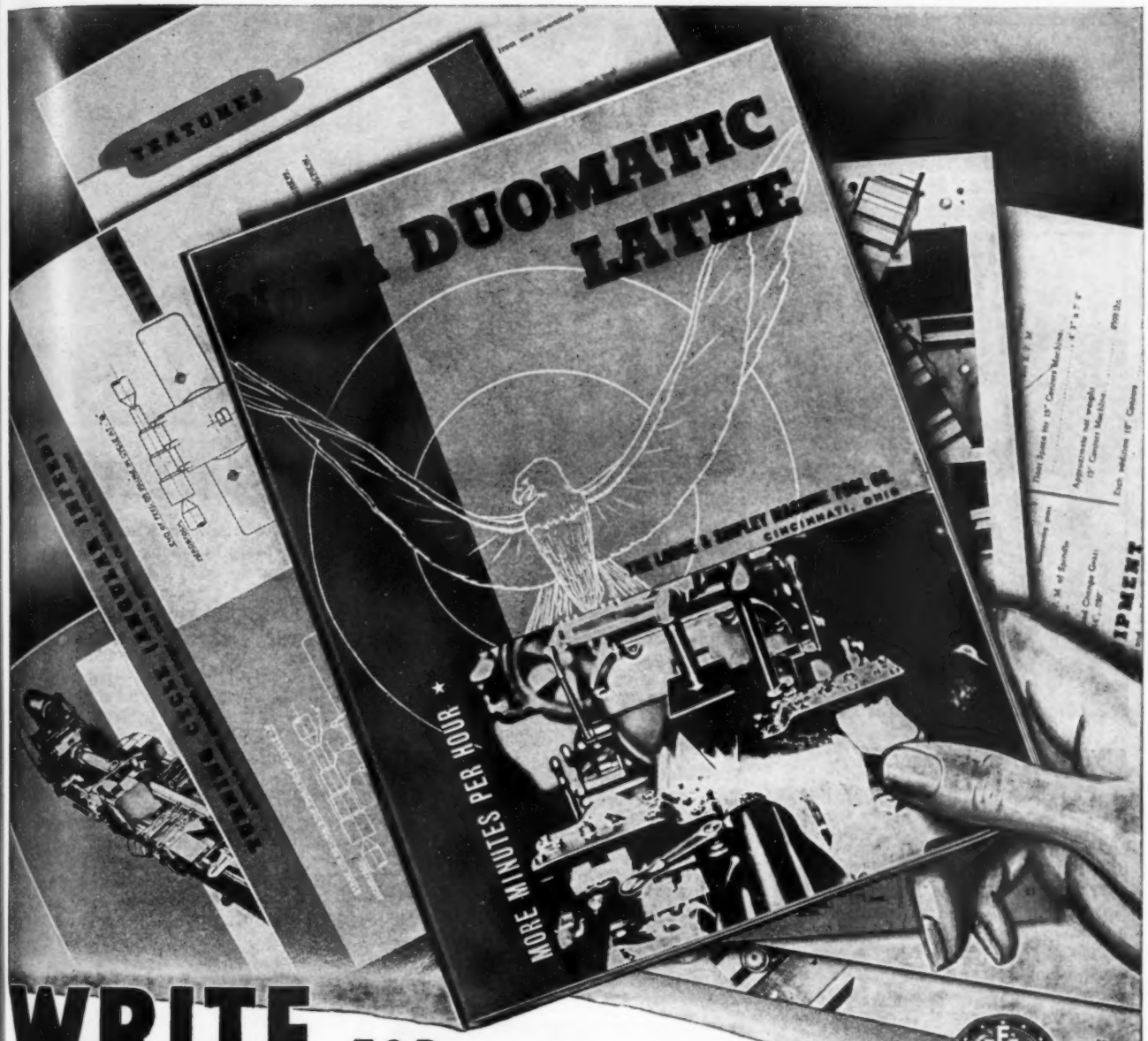
In the marking operation, the inspector selects the desired stamp, tilts the self-closing cover on top of the kit and inks the stamp by touching the pad underneath. After the stamp has been inked and withdrawn, the cover closes automatically. Thus acid fumes which may affect precision parts are not allowed to escape. The acid is neutralized by placing a drop of oil or neutralizer from the second bottle onto the marked impression.



Di-Arco No. 2 Hand Shear Handles Light, Medium Metals

Improvements in the Di-Acro No. 2 shear made by O'Neil-Irwin Manufacturing Co., Minneapolis, Minn., include increased strength, ease of operation and net weight, which is 75 lb.

The hand-operated shear is suited for precision work (duplicating to 0.001 in.) on light- and medium-weight metals, and can be quickly arranged for shearing, slitting, squaring, stripping or notching to close tolerances.



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1. . . Outstanding Features.
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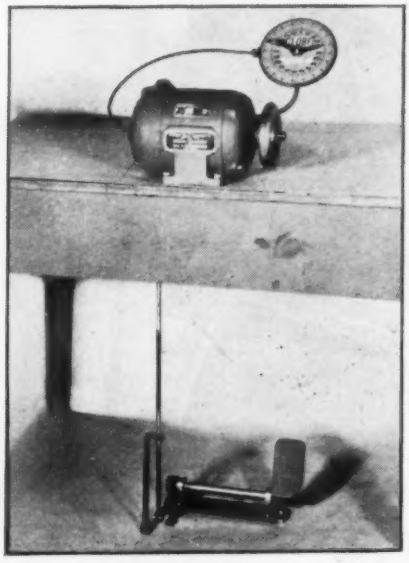
THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC LATHES

Maximum shearing width of the shear is 9 in. and it has capacity to cut 22 gage steel sheet for the full shearing width.

The blades are of tool steel, with a wide range of adjustments provided for wear and cutting control. They are reversible, thus offering double service without resharpening.

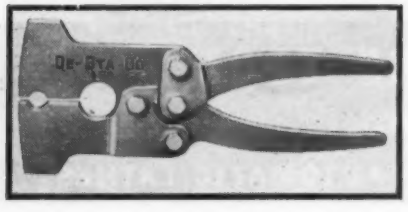


Globe A. C. Coil Winder Provides Wide Speed Range

A wide range of speeds is available in the coil winder for alternating current operation which has been introduced by Globe Tool & Engineering Co., 436 Davis Ave., Dayton, Ohio. From a minimum of ten to a maximum of over 4,000 r.p.m., in direct drive models, is provided. Control of the self-energizing brake, motor switch and speed control is synchronized from a floor-mounted pedal. The bench model is capable of winding wire sizes from No. 20 to 42 into coils up to 3-in. diameter, and 3 in. long. A visual counter is provided showing up to 10,000 turns, and is easily read at high speeds. For easy attachment of winding forms, a spindle is included.

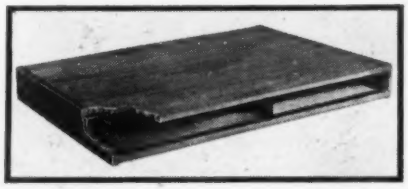
De-Sta-Co Toggle Pliers Hold Small Cylindrical Parts

For holding piping, tubes, rods or other cylindrical parts, Detroit Stamping Co., 343 Midland Ave., Detroit, Mich., has introduced No. 455 De-Sta-Co toggle pliers, designed for objects from ½ to 1¼ in. outside diameter. For other sizes the pliers are bored and slotted to order to suit requirements. They lock into position and hold securely at any point within their gripping range.



Palmer-Shile Hardwood Pallets For Power or Hand Fork Trucks

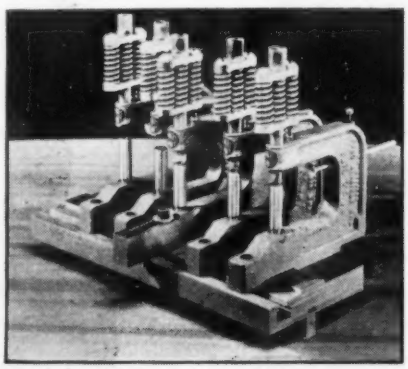
Instead of the all-steel construction pallets formerly made by Palmer-Shile Co., 780 So. Harrington Ave., Detroit, Mich., the company has introduced wood pallets with steel reinforcement. The alternate construction is designed for use with either power or hand fork trucks. It is of hardwood construc-



tion with replaceable boards. The single face model has metal bound ends with metal supports, while the double face model is steel armored.

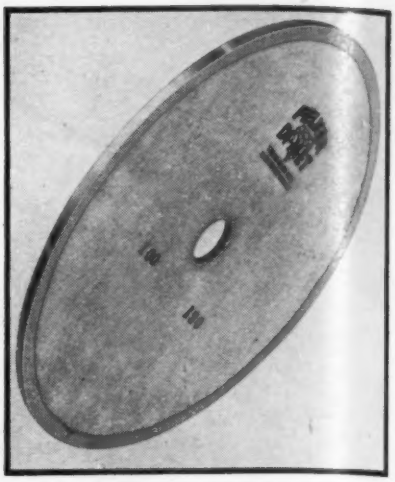
Wales Hole Punching Unit Provides Adjustable Adapter

The Wales Type CA hole punching unit, manufactured by Wales-Strippit Corp., North Tonawanda, N. Y., has a built-in adjustable adapter which provides an adjustment up to 1½ in. front to back for off-center or staggered hole patterns when used in set-ups on press brakes. With this adapter, the hole punching units have practically universal adjustment from left to right and front to back. They are available



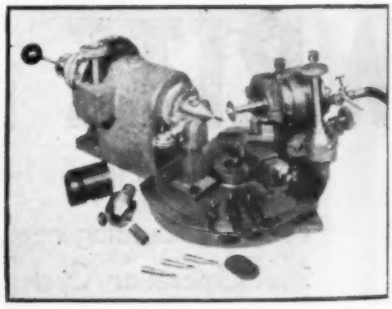
in a line of punch holes up to 5/16 in.

It is possible to locate the hole punching unit in exact position by simply sliding the unit along the rail. Where the holes are located off a straight-line pattern, the units can be moved front to back on this adapter and locked in position. The punch and die are held in alignment by the holder and are instantly removable for quick interchangeability. The three-spring selective stripper provides ample stripping pressure for any metal that the punch will penetrate.



Felker Di-Met Wheel Grinds Chip Breakers in Carbide

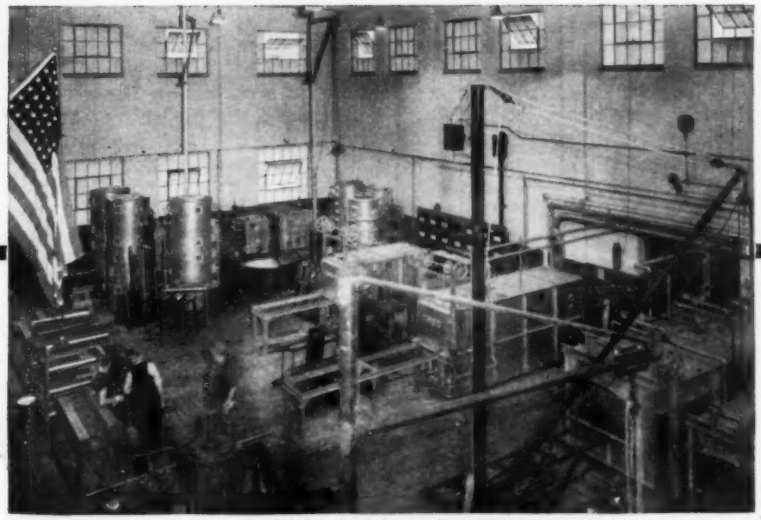
The Di-Met diamond wheel developed by Felker Manufacturing Co., Torrance, Calif., is made in 3, 4 and 6 in. diameters of ⅛ in. rim thickness and is suited for rapidly cutting chip breaker grooves and shaping and form grinding of carbide tips. The resinoid rim containing the diamond is bonded to a laminated linen core. The linen laminations are interlaid with a resinous compound and baked under high pressure, forming a rigid composition. The core has a considerable degree of elasticity which acts as a cushion, absorbing shock and sudden impact. These chip breakers are designed for use with a coolant. Similar blades of thinner construction are now available for cut-off operations on carbide inserts.



Onsrud Makes Air Grinder For Resharpening Router Bits

For resharpening spiral router bits, Onsrud Machine Works, 3910 Palmer St., Chicago, Ill., has produced the GF-41 grinder. It is powered by a three-stage impulse reaction-type air turbine motor which operates at 30,000 r.p.m. The entire motor assembly swivels for correct adjustment to any grinding angle. The vertical lift, as well as in and out adjustment of the motor unit is controlled through hand screws.

In operation the bit is held in the chuck and moved to and away from the grinding wheel by means of a lever.



A corner of the Colonial Heat Treat Department.

How to get more out of your Broaches------

BY PROPER HEAT-TREAT

The difference between an ordinary broach and a really good one is frequently traceable to the heat-treatment before grinding. Of course, you can't take all your broaches and heat-treat them yourself for longer life. But you can make sure that they are properly heat-treated.

One of the best ways to do this is to check into your broach supplier's heat treating equipment.

As a starter, we will be glad to tell you about our new, modern and complete Heat Treat Department. It will give you an idea why Colonial Broaches do such an outstanding job.

Ask for a copy of Broaching News—Vol. V, No. 2.

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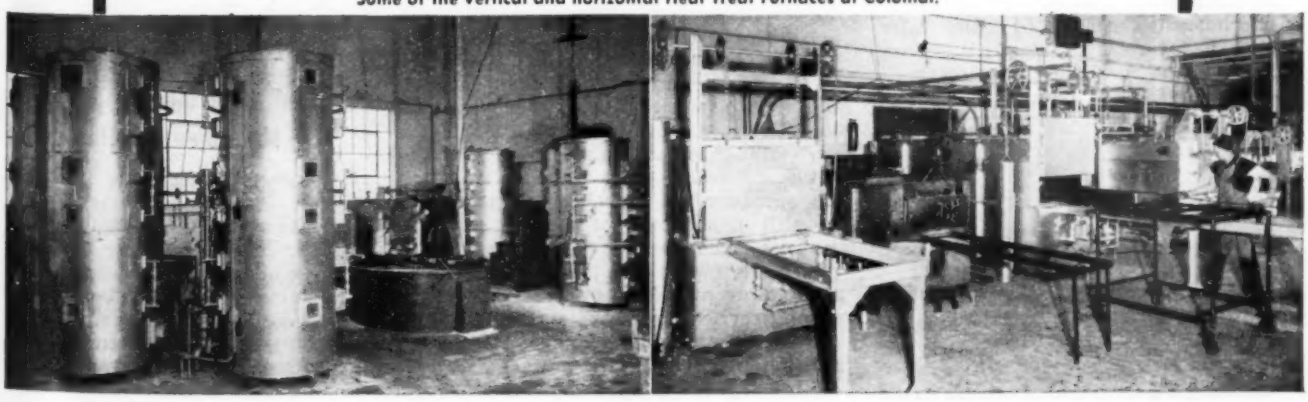
Broaches Broaching Machines - Broaching Equipment

Some of the vertical and horizontal Heat Treat Furnaces at Colonial.



Feed of the bit is controlled by a cam to give proper bit lead. A leather bellows, which is automatically operated as the bit feed movement takes place, keeps dust from the lapped surfaces.

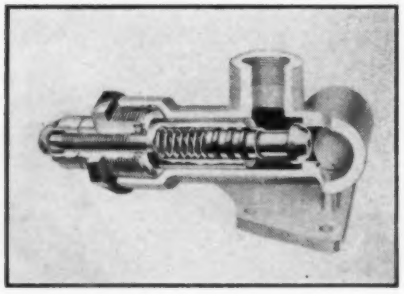
This grinder is furnished with ⅜ in. air hose and coupling, a dial indicator for setting bit diameters, a positioner for proper chucking of the bit, an 80-grit polishing wheel, and a 120-grit grinding wheel. Adapters are included for taper shank and ½ in. straight shank bits as well as a diamond point truing device mounted in an adjustable holder.

Markal N Paint Sticks Suited for Cold Surfaces

The Markal N paint stick made by Markal Co., 6 East Lake St., Chicago, Ill., produces on cold surfaces a wide, legible mark which is permanent, fade-proof and weatherproof. It is suited for surfaces such as metal, glass, wood and plastic. The markings dry quickly after application. This paint stick is available in red, white, blue, green, yellow and black, and can be applied to either wet or dry surface.

Merit Develops Relief Valve For Hydraulic Control Machines

For machines in which hydraulic controls are used, Merit Engineering Inc., 40 Clifford St., Providence, R. I., is offering a self-stabilizing relief valve. It is based on hydraulic balance and requires but one light spring to give a range of pressure control from 0 to 3,000 lb.

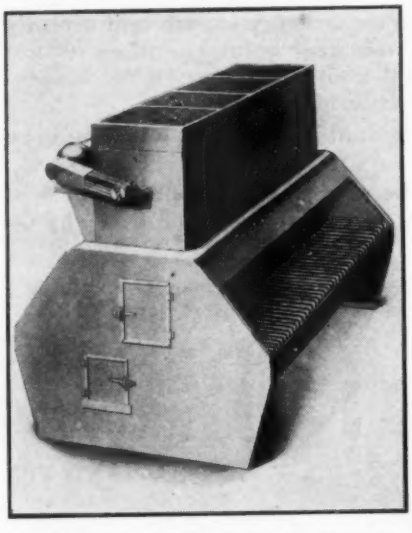


Operation of the valve is such that the pressure gage remains constant regardless of the variations in the pump speed. It has been designed to provide structural strength with less weight and vibration. Noise and chatter have been eliminated. Its construction also provides for interchangeability of parts. The valve is so stabilized that a slight turn of the adjusting element permits regulation of pressure to any desired degree. This relief valve is furnished for use with all standard tubing sizes, and for internal or external pipe threads or flanged ends.

Schneible Multi-Wash Bench Provides for Dust Removal

A multi-wash ventilated work bench is being manufactured by Claude B. Schneible Co., 3953 Lawrence Ave., Chicago, Ill., for removing dust from bench operations such as grinding, filing, chipping, buffing, cleaning and polishing of metals, molded plastic and vitreous parts. This bench provides for continuous dust removal by means of a dust removal control system.

The working surfaces of this bench are 10 ft. long and 30 in. wide. It is

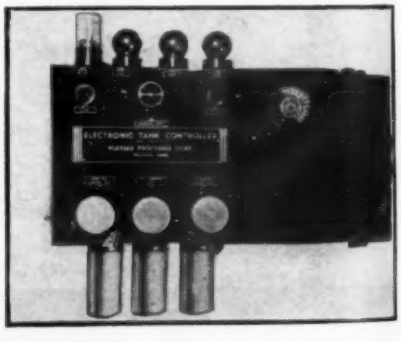


available in single and double side models and in any one of four arrangements. Either hardwood or steel grating can be furnished. The space under the grates is closed by a dust hopper which slopes to a longitudinal center tank. Air is drawn from the room and over the work by means of motor-driven fans, located in the top of the air-washing section and out of the dirty air stream. Dust particles from the operation are impelled against a set wall in the back of the bench or the wet panel below the grate and washed downward into the tank below. Dust is also picked up by the indrawn air and carried downward through the grates into the dust chamber where it is impinged on the wet surfaces.

Final removal of the dust is accomplished by washing the air in the collector units located within the bench. The cleansed air is discharged back into the workroom through a safety filter. Convenient removal periodically of the solids from the settling tank is provided by doors at either end of the unit. The water, oil or other liquid used as the cleaning medium is circulated by a vertical centrifugal pump.

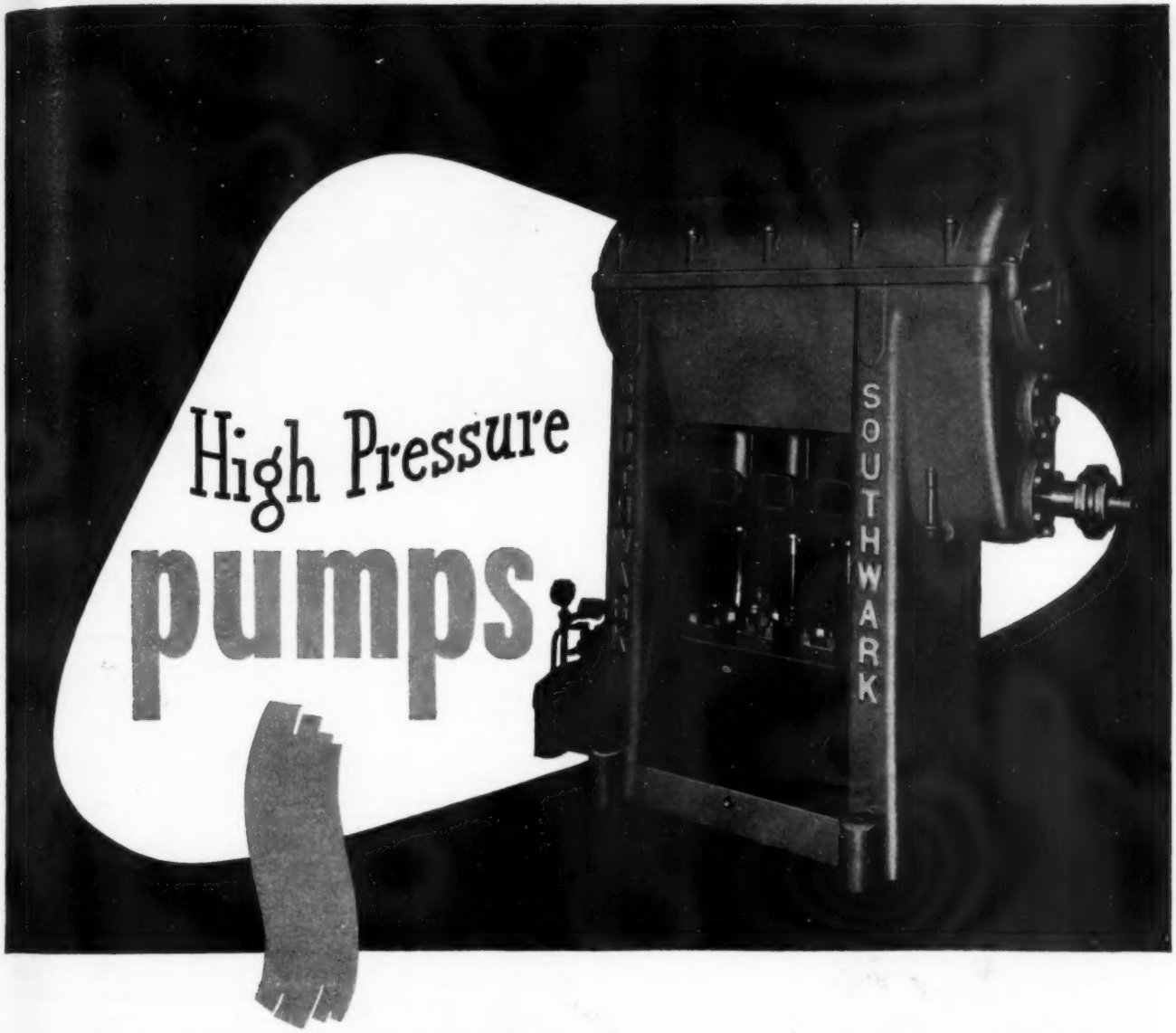
Atkins Offers Steel Saw For Standard Milling Machines

A high-speed steel saw, made in 3, 4, 5, 6 and 8 in. diameters for most standard milling machines, is being offered by E. C. Atkins & Co., 402 South Illinois St., Indianapolis, Ind. The saws are 0.062 in. on the tooth edge and 0.052 in. at the mandrel. Each tooth has a relief clearance ground at the back to the depth of the gullet, which allows for sufficient clearance where tolerances as close as 0.0002 in. must be maintained. Although designed originally for slotting supercharger wheels, the saw is suited for many other similar operations in a ferrous and non-ferrous metal.



Plating Tank Controller Maintains Solution Level

An electronic tank controller is being offered by Plating Processes Corp., Holyoke, Mass., in three models, the Midget, Standard and Master. The instrument automatically maintains a predetermined solution level, while at the same time controlling temperature whether the solution has a tendency to heat or to cool. The temperature control section uses a thermostatic bulb



Southwark's line of High Pressure Triplex Pumps have been thoroughly tested in actual service. Sound design and substantial construction have earned for these pumps a reputation for long life, low maintenance and high overall efficiency.

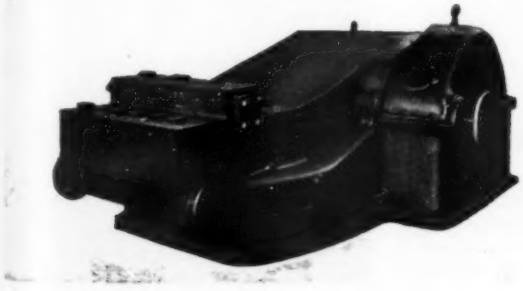
For delivering large volumes of water in conjunction with hydraulic press installations, horizontal pumps are built in 12-, 15-, and 18-in. stroke lengths. A 3-plunger arrangement provides a 60 degree overlap in discharge impulses and tends to smooth out pump pulsations.

The 12-in. stroke pump discharge ranges from 23 gpm at 7,500 lb per sq in. to 170 gpm at 1,000 lb per sq in.; that of the 18-in. stroke unit from 88 gpm at 7,500 lb per sq in. to 685 gpm at 1,000 lb per sq in. Other capacities and corresponding pressures are available.

Where a smaller capacity pump is required, the vertical pump—illustrated—is offered. Their capacities range from 2 to 100 gpm at pressures from 15,000 to 1,000 lb per sq in. respectively.

Write for Bulletin P-106 which contains a complete description of these pumps with tables showing dimensions, capacities and power requirements.

Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco.



BLW THE BALDWIN GROUP

BALDWIN SOUTHWARK

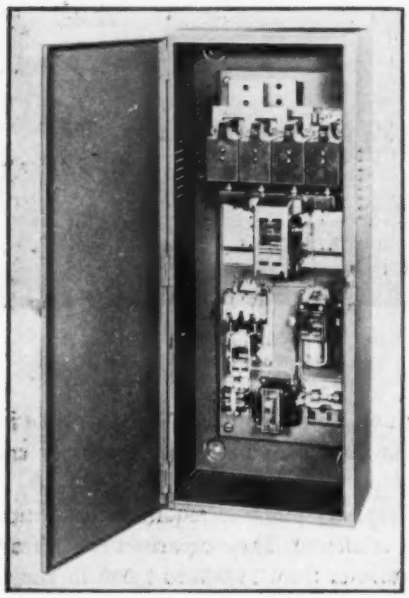
Division **THE BALDWIN LOCOMOTIVE WORKS,** *Philadelphia, Pa.*

for all types of solutions. Installation includes warning signals both at the tank and in a watchman's station, and is designed to provide automatic starting and stopping.

The Midget unit measures 12×8 in. and 3 in. deep, weighs 8 lb. It has an on and off switch and pilot light when the instrument is turned on. This unit can be used to automatically replace drag-out solution from a rinse tank into the main process tank. It has current interruptions in case of electronic tube failure, and a visual light indicator which shows when the filling mechanism is in operation.

The Standard model has heat and cool cut-off at the instrument in case of high level. Dimensions of this unit are 12×8 in. and 3 in. deep, weighs 11 lb. It has a visual colored light indication when heating, cooling, or filling is taking place.

The Master model is a combination of the Midget and Standard plus automatic clock features and other devices that completely control all tank operations. This model measures 16×8 in. and 3 in. deep, weighs 16 lb.



Square D Safety Control For A.C. Arc Welders

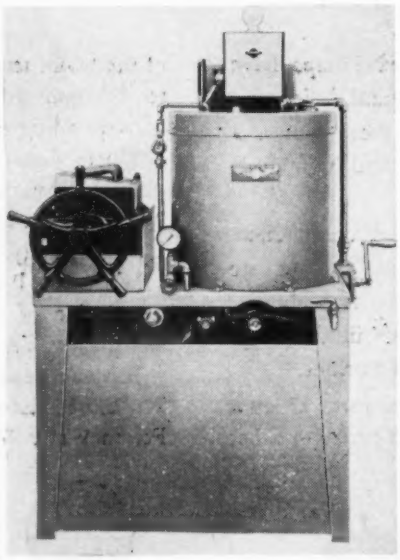
A safety control for alternating current transformer type arc welders, which can be used with any make or model, is offered by Square D Co., Industrial Controller Div., Milwaukee, Wis. It is designed to eliminate the hazards of high open circuit voltages of this type arc welder and automatically disconnects the welder transformer after the arc is broken. As soon as the operator touches the electrode to the work, the transformer is automatically reconnected, thus the arc is struck without delay.

This safety panel provides high economy because the welding transformer primary circuit is connected to the power line only while the arc is held. Substantial saving in power is effected when a number of welders are used on a single power system. The external connections are simple and internal connections of the welder do not have to be disturbed.

Hilco Portable Oil Filter Available in Wide Size Range

Hilliard Corp., 370 West Fourth St., Elmira, N. Y., has introduced the Hilco portable oil filter available in sizes ranging from 1 gal. per min. up to several hundred barrels per hour, depending on the type of fluid to be filtered. The unit is convenient for operating in remote sections, or at points where electric power is not readily available.

The unit consists of a standard Hilco Hyflow oil filter, a small gasoline engine driving a rotary pump for forcing the oil through the filter. The exhaust gas is passed through a jacket around the filter for heating the filter unit.



Youngstown Oil Reclaimer Is Small Capacity Machine

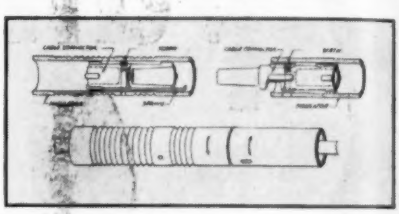
A small capacity lubricating oil reclaimer is being manufactured by Youngstown Miller Co., Sandusky, Ohio. This Model A-8 oil reclaimer has a capacity for purifying 8 gal. of oil in 70 to 90 min. It is designed to restore used oils to substantially the same values of fire, flash, viscosity, color, neutralization number and precipitation number as new oil.

The machine has a two-stage filter press, is semi-automatic, operates under thermostatic control and utilizes common refinery earths. Seven other sizes for handling larger quantities of lubricating or hydraulic oils are also available.

Jackson Cable Connector Meets Arc Welding Needs

A cable connector that locks tightly, and which is fully insulated, has been developed for arc welding by Jackson Products, 3265 Wight St., Detroit, Mich., and is known as the Quik-Trik.

The female section is soldered to the cable lead, while the male section is soldered to the cable extension. Removable insulators are securely held in position with screws. With a twist

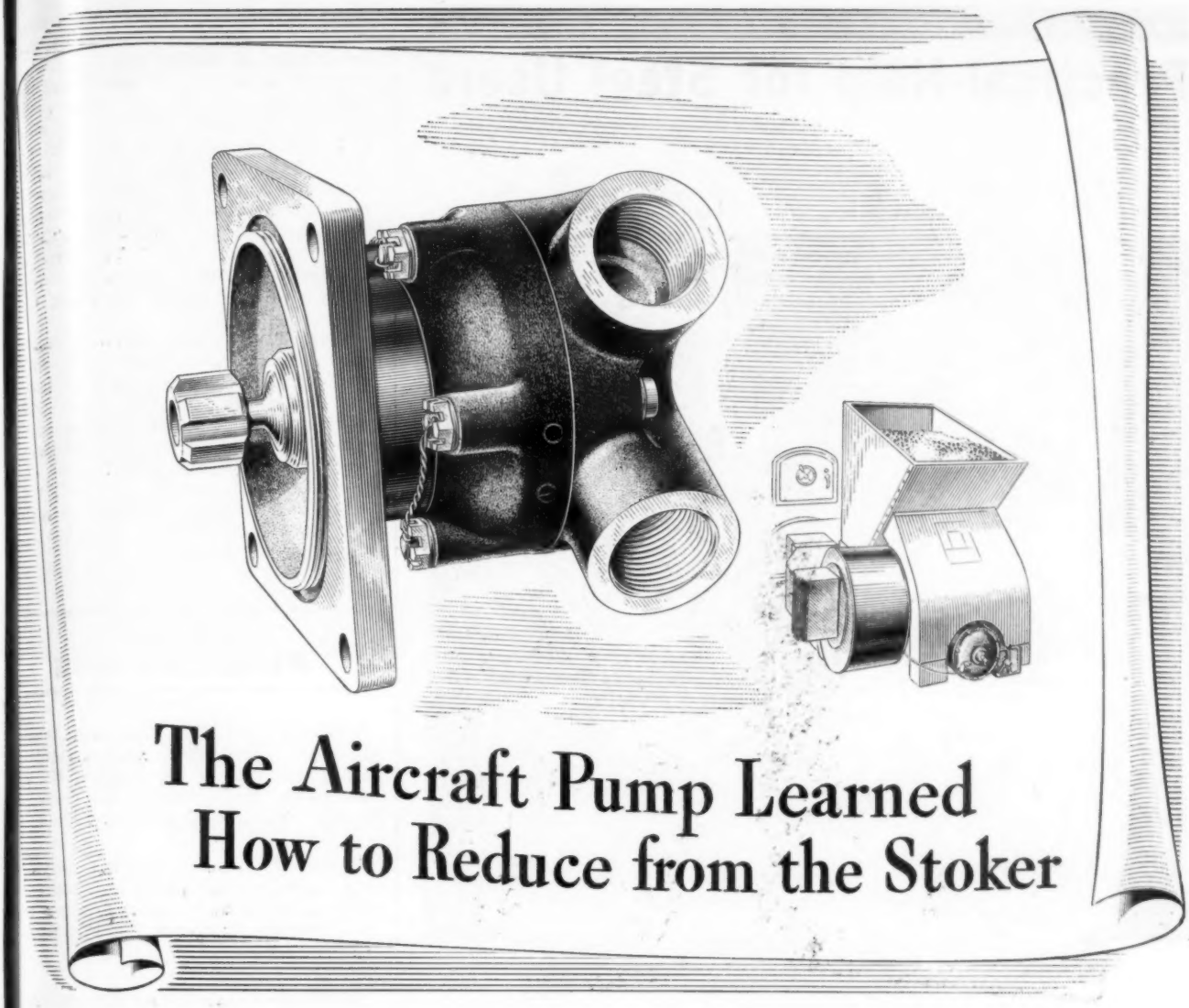


the locking spring rides the cam into position, holding both sections. To unlock, it is only necessary to twist the sections apart.

When installed on a cable lead, the female section may also be used as a holder handle and connected directly to the stinger end of a Jackson Model TA holder.

Sly Blast Cleaning Machine Is Epuipped With Six Tables

A centrifugal-type, multiple-table blast cleaning machine has been developed by W. W. Sly Manufacturing Co., 4735 Train Ave., Cleveland, Ohio. This machine has six 30-in. diameter tables



The Aircraft Pump Learned How to Reduce from the Stoker

YOU'D hardly expect an airplane pump to have even a nodding acquaintance with a coal stoker. Down-to-earth, extremely rugged, the stoker is built with heavy service conditions uppermost in mind. It's no surprise, then, to find Torrington Needle Bearings on the job—with their high load-carrying capacities, and ease of lubrication.

With aircraft pumps, the story is somewhat different. Here the design problem was not so much one of ruggedness as keeping size and weight down to an absolute minimum. But the fact that no special means of lubrication need be provided with the Needle Bearing soon had the pump people "weighing" its other advantages, with an eye to simplifying design and increasing production efficiency.

Everyone of its features, they found, fitted right into the military airplane picture. The Needle Bearing's compactness squarely met the problem of space limitations invariably encountered in aircraft design, and contributed importantly, also, to weight-reduction. While long-life, low-cost, and ready availability for essential applications are among the significant "little things" which enabled the industry to meet and top the staggering production demands of the Government's airplane program.

NOW CONSIDER YOUR OWN POSTWAR DESIGNS

Isn't there an idea in the Torrington Needle Bearing which you might use to good advantage in your postwar designs? Tomorrow's most-wanted products will be considerably lighter, yet capable of heavier loads . . . longer-lasting, yet requiring practically no maintenance attention. Let Torrington engineers show you how you can give your product these and other new-day advantages of the Needle Bearing. As preliminary information, a list of typical applications in Catalog **105** may prove helpful to you in postwar planning.

NEEDLE BEARINGS—ALL TYPES—ALL SIZES

NEEDLE BEARINGS TYPE DC are complete, self-contained units consisting of a full complement of rollers and a drawn, hardened outer race. They offer the advantages of small size, low cost, high capacity—and easy installation.

NEEDLE BEARINGS TYPE NCS consist of a full complement of rollers and a relatively heavy hardened outer race. They are furnished with or without inner races. Needle Bearings Type NCS are adaptable to heavier loads than Needle Bearings Type DC.

NEEDLE ROLLERS TYPE LN are produced in a range of sizes for assembly into low-cost, high-capacity anti-friction bearing units. They are designed for use in applications which require assembly of the bearing on the job.

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend, Ind.

Makers of Needle Bearings and Needle Bearing Rollers

New York Boston Philadelphia
Detroit Cleveland Seattle
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TORRINGTON NEEDLE BEARINGS

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Complete Information on Ryerson Stocks in Four Handy Volumes

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Lists over 10,000 kinds, shapes and sizes of steels on hand. Your guide to the world's most complete stocks of "Immediate Steel."

2. RYERSON STEEL DATA BOOK
Handbook of steel information including charts, conversion tables, definitions, specifications, steel-working hints, etc. . . . complete and authoritative.

3. NE ALLOY STEEL BOOKLET
New data on average physical properties and heat treatment response for NE Alloys. Jominy Testing fully explained. Tables convert hardenability into tensile strength, yield points, etc.

4. AIRCRAFT ALLOY STEELS
Aircraft manufacturers and subcontractors will want this booklet on Alloy Steels. It includes condensed AMS and AN-S specifications.

If you have not received the new 1943-44 Ryerson Stock List write for your copy today. Other Ryerson Service Literature is also available on request. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE

which revolve around a common axis, but may be equipped with more tables or spindles of smaller size.

Pieces to be cleaned are placed on the tables, and as the tables enter the blast chamber they engage with a V-belt drive for rotation under the blast. The movement of the table through the blast chamber is indexed and timed. The timing and rotating speed of the tables are adjustable to meet various conditions. The machine accommodates work with a maximum clearance of 15 or 29 in. above the table.

The blast cleaning action is generated by a Centri-Blast wheel with four hard alloy blades, with no moving parts inside of the wheel. The used abrasive is returned to the blast wheel by a bucket elevator. Provision has been made for screening of the abrasive and removal of ineffective fines and dust. Pushbutton stations are interlocked to assure correct starting order of the motors.

TRADE PUBLICATIONS

ANGLE COMPUTER The Angle Computer Co., 5720 Melrose Ave., Los Angeles, Calif., has issued Bulletin No. 2, describing and picturing the various uses of the Studler angle computer.

BEADING A folder, A22-643, describing, picturing and giving specifications of its beading kit has been prepared by The Parker Appliance Co., Cleveland, Ohio.

BELTING CONSERVATION A file-size 20-page booklet, "Leather Belting Conservation and Other Engineering Data" is available from the Baldwin Belting and Leather Co., 85 Chambers St., New York, N. Y.

BELT LACING Bulletin No. 773 of the Mill Supply Div., The Bristol Co., Waterbury, Conn., is a 4-page folder giving prices, sizes and descriptions of that firm's line of steel belt lacing.

CABLE STRETCHER The five-station, multiple use, automatic cycle hydraulic cable stretcher manufactured by The Parker Appliance Co., Cleveland, Ohio, is described in folder A-25-643 available from that firm.

CARBIDE TOOLS A catalog describing and pricing their finish ground, carbide tipped tools has been published by New England Carbide Tool Co., 60 Brookline St., Cambridge, Mass. It covers all dimensions, carbide forms clearances and prices on the company's found standard styles of right- and left-hand tools as well as their square and pointed tipped tools. A 8½ × 11 in. cardboard wall chart, covering this same information is available to toolrooms and purchasing departments.

YOUR POSTWAR PLANNING

AND VICKERS HYDROMOTIVE CONTROLS

While postwar plans cannot now be precisely determined, it is clear that one need is for improved products to keep manufacturing at a high level and provide the work necessary to maintain the American standard of living.

After the war, business must be won against stiff competition in practically every field. Present models of many machines will be made obsolete by others with important improvements that cannot be ignored.

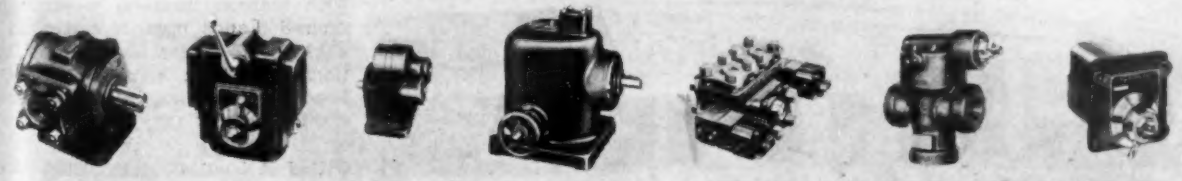
The exceptional versatility of Vickers Hydromotive Controls provides unusual opportunities to the machine designer . . . opportunities for far-reaching improvement in the important fields of better control—higher production rates—wider utility—greater safety—elimination of operational difficulties.

Your postwar planning is undoubtedly now underway. Vickers Application Engineers will welcome opportunities to cooperate with you.

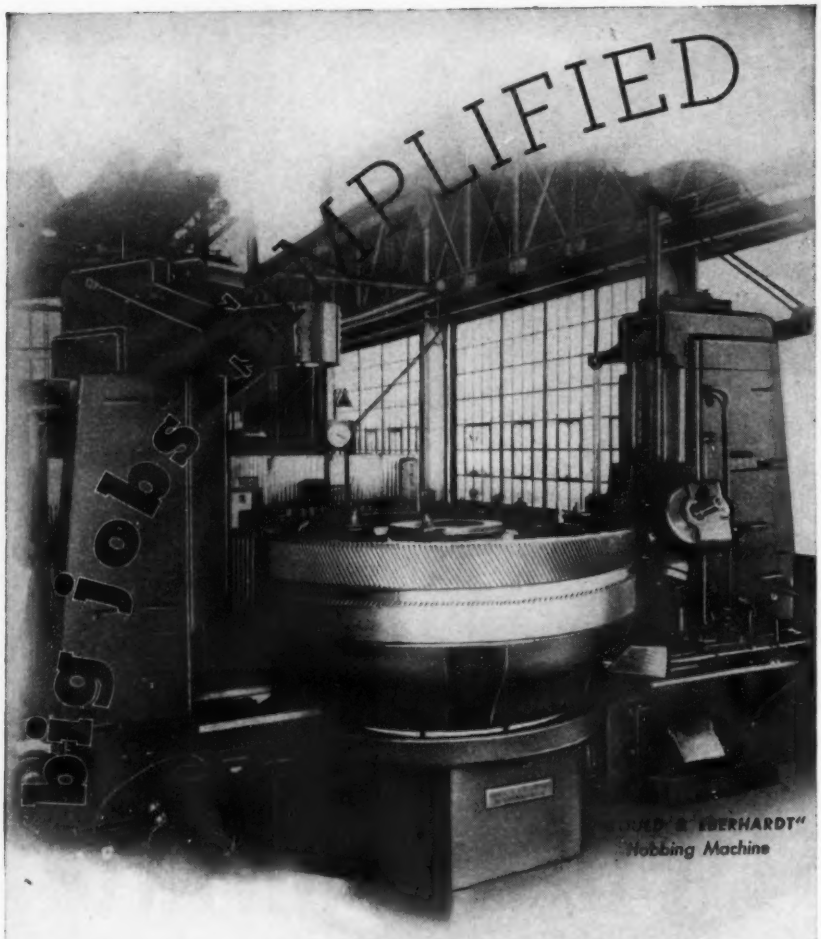
VICKERS *Incorporated* • 1400 OAKMAN BLVD. • DETROIT, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



CONSTANT DELIVERY PUMPS | CONTROL ASSEMBLIES | FLUID MOTORS | VARIABLE DELIVERY PUMPS | DIRECTIONAL CONTROLS | PRESSURE CONTROLS | VOLUME CONTROLS



● Mechanical giants which otherwise would demand an operator's continuous attention to oiling—or have their life-span severely cut—are made self-oiling by machine manufacturers' foresight. With BIJUR-equipped machines there are fewer shut-downs . . . less "time out" for repairs and maintenance.

Peak-load production is insured!

BIJUR LUBRICATING CORPORATION

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1613

CASTINGS A 4-page bulletin covering the production facilities of the three plants of the Howard Foundry Co., 4908 Bloomingdale Rd., Chicago, Ill., in magnesium, aluminum, bronze, brass and other non-ferrous metals has been prepared for distribution. Weight comparisons and the mechanical properties of magnesium are given.

CLUTCHES Engineering data of the "Maxitoro" friction clutches have been gathered in a booklet (series No. 3) prepared by The Carlyle Johnson Machine Co., 52 Main St., Manchester, Conn.

COLD DRAWING "Effect of Cold Drawing on Mechanical Properties of Welded Steel Tubing," is the title and subject of Univ. of Illinois (Urbana, Ill.) Engineering Experiment Station Bulletin No. 341, Vol. 40, No. 27. It is a 32-page study of the subject, with graphs, charts and illustrations, by Winston E. Black. 40 cents.

CUTTER RECLAMATION A 6-page bulletin, GT-157, on how to reclaim carbide tipped cutters and worn out HSS cutters has been issued by Carboloy Company, Detroit 32, Mich.

CUTTERS "Clark Adjustable Cutters" is the title and subject of a 2-color folder issued by Robert H. Clark Co., 3424 Sunset Blvd., Los Angeles, Calif. Various uses are pictured, the cutters are described and prices are given.

CUTTING OIL The Basic Oils Co., 801 Bartlett Bldg., Los Angeles, Calif., has issued a file-size publication describing a special type oil designed to provide a film for cutting tools used in precision machine work and on hard and tough alloy steels.

CUTTING TOOLS A booklet, No. 260, published by the Behr-Manning Division of Norton Co., Troy, N. Y., is devoted to "Hand Stoned Cutting Tools for Faster, Better, More Cuts."

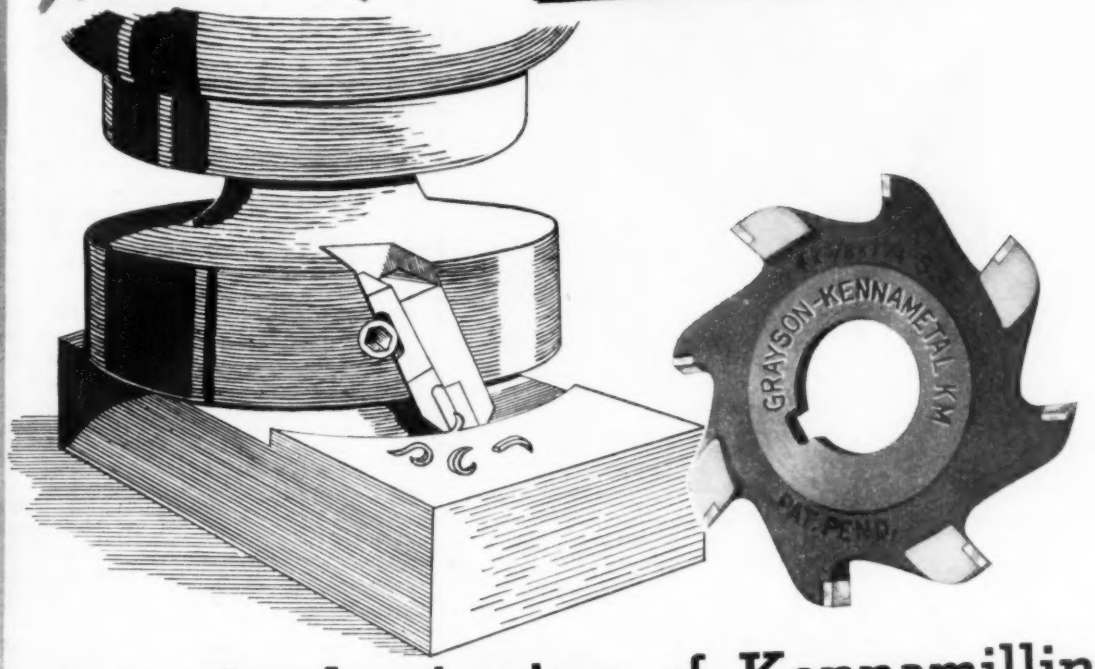
DIMENSIONAL CONTROL A portfolio of 40 large illustrated charts on "Dimensional Control—Theory and Industrial Application," for use in classroom training of inspectors is now available from The Sheffield Corp., Dayton, Ohio. Included is a 28-page booklet outlining a talk to be given with the charts presenting an overall picture of gaging practice in modern industry. $3.50.

DRAFTING ROOM SUPPLIES A new folder illustrating how an Ozalid print with maroon lines on a white background stands up in comparison with a blueprint under actual shop conditions, has been published by Ozalid Products Div., General Aniline & Film Corp., Johnson City, N. Y.

DRILL AND TAP GRINDERS A catalog (Bulletin G. L. 5-15-43) issued by Gallmeyer & Livingston Co., Grand Rapids, Mich., describes and pictures

★ SECOND IN A SERIES ★

This simple KENNAMETAL *cutter*



Was the beginning of Kennamilling and a NEW ERA of MILLING STEEL

KENNAMILLING, variously called "Hyper-milling" or "Super-milling", was begun when this simple cutter began to skid chips from hard aircraft steel.

Until 1940 the milling of steel was confined to the slower, high speed steel cutting tools. With the introduction of **KENNAMETAL**, however, with its inherent transverse rupture strength and non-galling properties, efficient milling of steel became possible. The strength and hardness of **KENNAMETAL** steel-cutting carbides now have been combined with the rugged Meehanite bodies of **GRAYSON** milling cutters to form the **GRAYSON-KENNAMETAL** shock-resistant milling cutters, designed for maximum production on milling operations on all metals.

The cutter illustrated—with only one cutting tool—replaced an eight-flute high speed steel mill, stepped up the cutting speed from 80 rpm to 323 rpm, and increased the table feed per minute from ½" to 3-½".

This single **KENNAMETAL** cutter produced as many pieces per grind as the eight-flute high speed steel mill, but in only one-seventh the time. During the job, even more time was saved on grinding than on cutting.

KENNAMETAL milling cutters, like **KENNAMETAL** boring and turning tools, produce more finished parts per machine per day.

Write for information about **KENNAMILLING** and solve your milling problems.

KENNAMETAL *Inc.*

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Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
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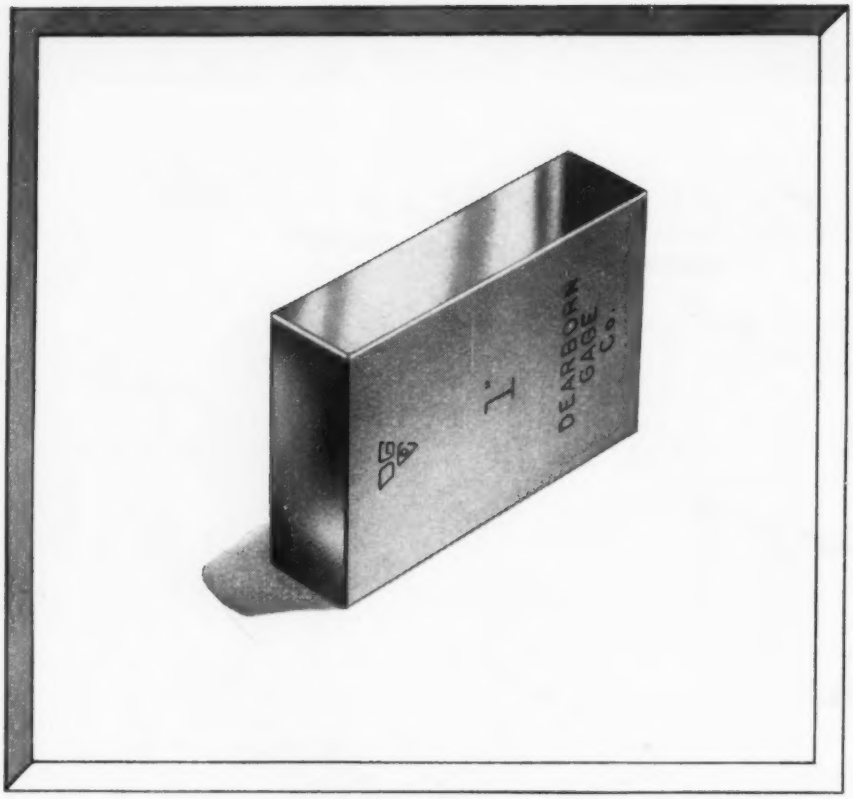
KENNAMETAL
THE All American CARBIDE



A Picture of Accuracy

DEARBORN GAGE CO. 22035 BEECH STREET DETROIT, MICHIGAN

Originators of Chromium Plated Gage Blocks

ACCURACY is a family tradition with Elmer Ellstrom and his sons, makers of Dearborn Chromium Plated Gage Blocks, for it was Hjalmer Ellstrom the grandfather who was instrumental in developing the first gage blocks ever used. Today the third generation is carrying on this highly specialized work by maintaining guaranteed accuracies in chromium thus making available to American manufacturers standards with "longer wearing millionths." . . .

that company's line of "Grand Rapids" drill and tap grinders, details the "Conditions Required for a Perfect Working Twist Drill," and furnishes drawings and statistics of the constructional features of the equipment, along with other pertinent information.

ELEVATORS A folder issued by Revolvator Co., North Bergen, N. J., illustrates and describes that firm's line of hydraulic freight elevators. The folder includes illustrations of interesting installations.

FLOW Bulletin No. 340, "Loss of Head in Flow of Fluids Through Various Types of One-and-one-half-inch Valves," by Wallace M. Lansford, has been issued by the Engineering Experiment Station, University of Illinois, Urbana, Ill.

FLUORESCENT FIXTURES Emphasis is placed on simplification, standardization and adaptability of the new line of non-metallic industrial fluorescent reflectors, in a catalog published by the manufacturer, Sylvania Electric Products, Inc., Salem, Mass.

GAS FURNACES Condensed Catalog and Data Book No. 604, in pocket size, with plastic binding and with complete index tabs, has been issued by American Gas Furnace Co., Spring and Lafayette Sts., Elizabeth, N. J. The 182 pages briefly tell the story of the many products manufactured, and of the services available.

GEAR MANUFACTURERS A booklet prepared by the American Gear Manufacturers Association, Empire Building, Pittsburgh, Pa., tells the complete story of that organization, including its history, aims and purpose, as well as a description of the work it has done and is doing.

GOVERNMENT ORGANIZATION The Summer edition of the United States Government Manual, a 707-page reference book on the creation and organization, functions and activities of the Federal Departments and Agencies, is now available from the Superintendent of Documents, Government Printing Office, Washington, D. C. Single copies $1; subscriptions covering three editions, $2.75.

GRINDERS "Grand Rapids" Surface grinders, manufactured by Galmeyer & Livingston Co., Grand Rapids, Mich., are described, pictured and pertinent details given in Bulletin No. 4-10-43 published by the manufacturer.

GRINDING Precision "wet belt" machining is the subject of a file-size book about to be issued by Porter-Cable Machine Co., Syracuse, N. Y. Described and pictured in use is wet belt machining equipment, as well as the company's other surfacers, disk grinders, milling machine attachments, shapers and portable surfacers.

INDUCTION HEATING The General Electric Co., Schenectady, N. Y., has published a catalog insert, "G-E Electronic Heaters," describing and picturing the apparatus that corporation manufactures for heating metals.

LATHES Catalog No. 9C, published by the South Bend Lathe Works, South Bend, Ind., is devoted to that company's 9-in. lathes, Models A, B and C. Twelve-page and file size, it illustrates and describes both the bench and metal column base types available.

LUBRICANTS A 4-page illustrated bulletin, No. 423-AW on "dag" colloidal graphite as a high temperature lubricant has just been released by the Acheson Colloids Corp., Port Huron, Mich.

MAP READING In keeping with the company's advertising campaign, Consolidated Vultee Aircraft Corp., 350 Fifth Ave., New York, N. Y., has published a booklet on modern global geography and map reading. It is intended to help readers see more clearly today's world as airmen know it and as the country must deal with it.

MARKER The Parker Appliance Co., Cleveland, Ohio, has issued a folder, A21-643, picturing and describing its road and bar marker and describing its uses.

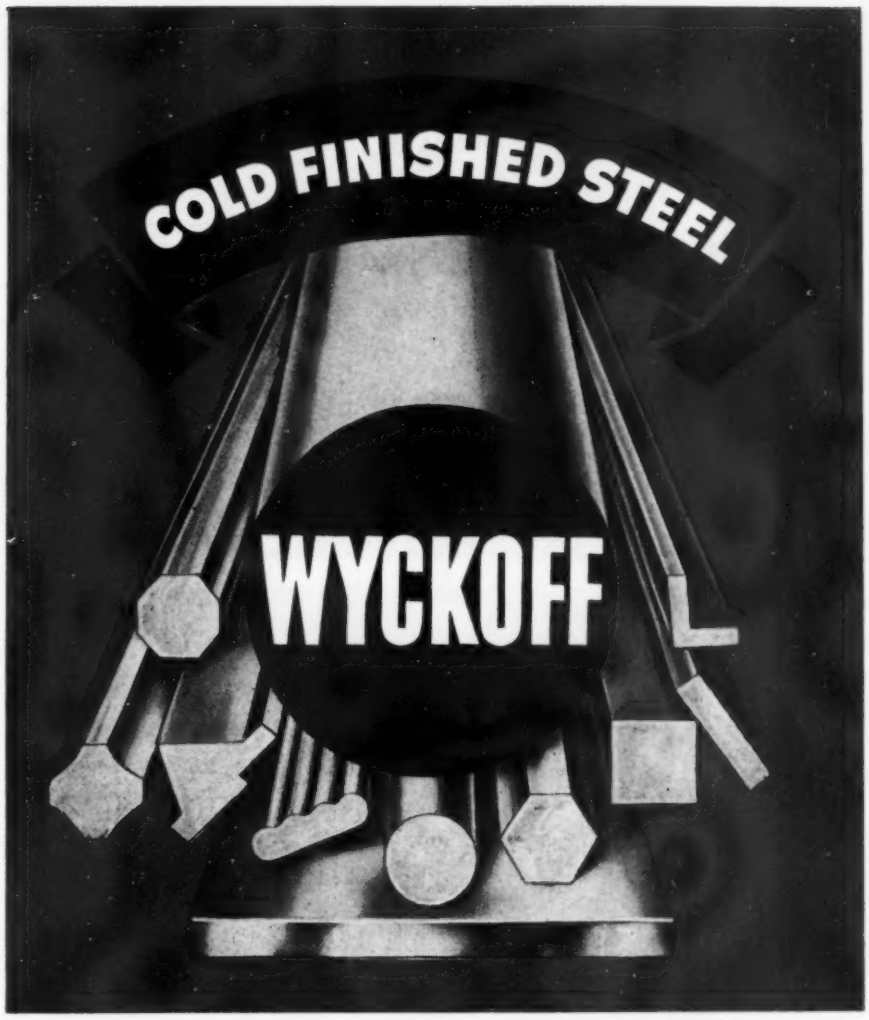
MOTORS Catalog insert 6-1, form 344A, dealing with squirrel cage induction polyphase motors of 1/6 to 600 hp., and "how to select the one best suited for the application," has been issued by Century Electric Co., 1806 Pine St., St. Louis, Mo.

OILSTONE FILES Behr-Manning, Troy, N. Y., has issued pamphlet No. 242, describing, picturing and pricing its line of "India and Hard Arkansas" oilstone files.

PACKAGING The 1943 Packaging Catalog of the Packaging Catalog Corp., 122 E. 42 St., New York, N. Y., furnishes a review of a year and a half of packaging goods for war, and under wartime conditions. Based on first-hand information gathered in hundreds of packaging plants and on the fighting fronts, the new volume features illustrations of the many ingenious packages developed, has articles on package planning in wartime, packaging testing, color standards, and other pertinent information.

PIPE BENDS AND COILS Alloy Mfg. Co., 3039 Brereton Ave., Pittsburgh 6, Pa., has just issued a folder illustrating some of the many types of stainless pipe bends and coils being produced for airplane manufacturers.

PLYWOOD MOLDING Recent developments in the technique of flexible bag molding of curved plywood are assembled in a new 16-page, illustrated



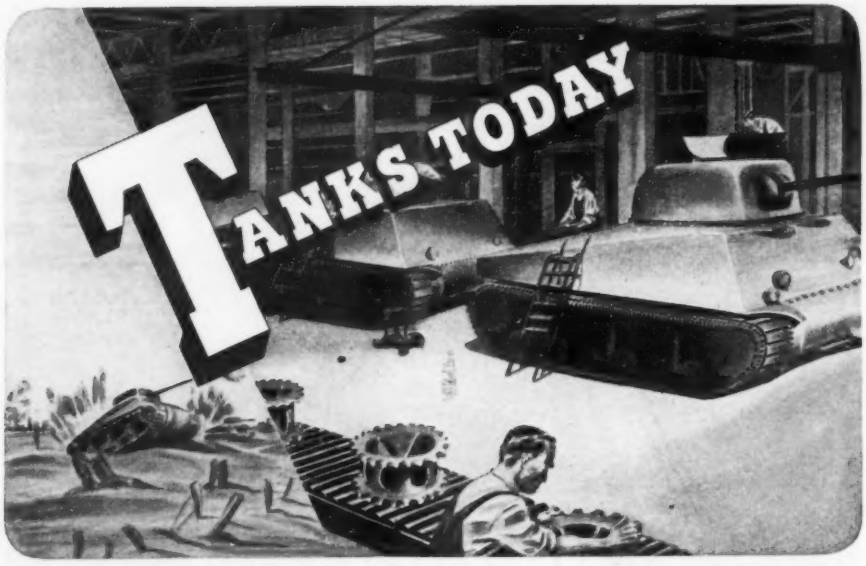
Industry's Headquarters

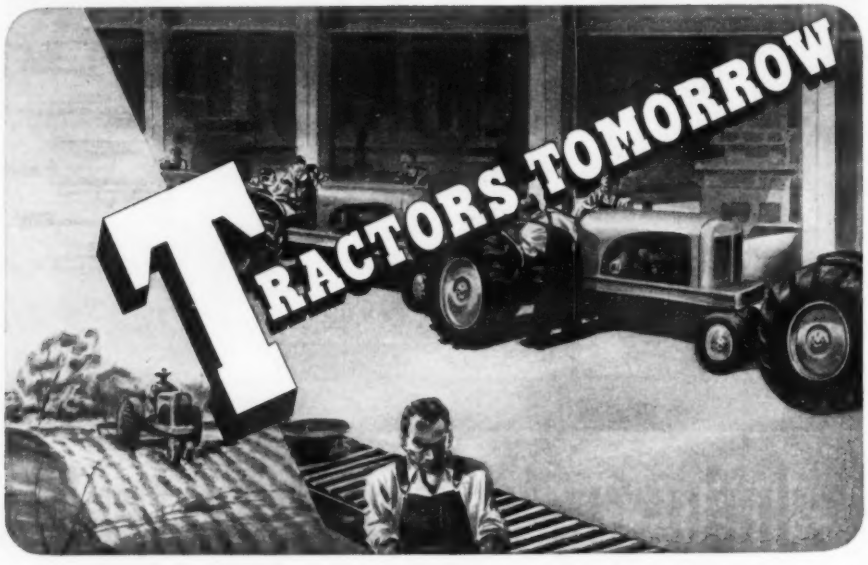
FOR

CONTROLLED CARBON AND ALLOY STEELS • TURNED, POLISHED, GROUND AND POLISHED SHAFTING • ANNEALED, STRAIN AND STRESS RELIEVED, HEAT TREATED, QUENCHED AND TEMPERED STEELS • WIDE FLATS UP TO 12" x 2"

Our Army-Navy "E" Flag,—first awarded in July 1942, now carries two stars for continuous outstanding production. Wyckoff was originally given the Navy "E" award in January 1942 and the Navy Burgee "E" in April of the same year.

WYCKOFF ★ ★
DRAWN STEEL COMPANY
FIRST NATIONAL BANK BUILDING, PITTSBURGH, PA.
3200 SOUTH KEDZIE AVENUE, CHICAGO, ILLINOIS





- - Standard Conveyor Engineers Will Be Ready —With Added "Know-How" to Their 35-Year Experience Record—For Conveyor Jobs to Come

The experience record of the Standard Conveyor organization spans a period which includes two world wars.

For more than 35 years Standard Conveyor Company has concentrated on power and gravity conveyors. Such specialization has developed improved design and materials in the conveyors themselves and given Standard Conveyor engineers an invaluable reservoir of practical experience.

Knowing how to apply power and gravity conveyors to best advantage is equally as important as building them well. Its service record with American business and industry attests Standard Conveyor Company's ability to do both.

Write for valuable reference book, "Conveyors by Standard" Catalog AM-7

STANDARD CONVEYOR COMPANY

General Offices: NORTH ST. PAUL, MINNESOTA

Sales and Service in All Principal Cities

★ ENGINEERED FOR FASTER PRODUCTION ★

bulletin on that subject, prepared by Resinous Products and Chemical Co., Washington Square, Philadelphia, Pa., and available upon requests on company letter heads.

PUNCHES Bulletin G, of the Wales-Strippit Corp., North Tonawanda, N. Y., gives a brief description of that company's manufacturing and engineering facilities as well as the patented features built into Wales punching and notching units.

SEPARATORS The Stearns Magnetic Mfg. Co., Milwaukee, Wis., has issued Bulletin No. 120 describing and illustrating its "Magnetic Type 'QS' Screen Filter Separator."

SHIFT SCHEDULES The Industrial Relations Section of the Department of Economics and Social Institutions, Princeton University, Princeton, N. J., has published "XV. Shift Schedules for Continuous Operation," "a digest of current practice for the use of managements facing the need for a rearrangement of schedules to provide a work week of 48 hours for employees." 20 cents.

SLING CHAINS S. C. Taylor Chain Co., Hammond, Ind., has prepared specification sheets for single and double sling chains, by which all dimensions, fittings, etc., are easily and accurately recorded for orders and estimates.

SOCKET SCREWS Two bulletins are offered by the Bristol Co., Mill Supply Div., Waterbury, Conn., pricing their Bristol multiple spline (bulletin No. 849) and hex socket (bulletin No. 850) screws. New listings of regular stocked items are given along with standard sizes available on order.

SUBCONTRACTING The Smaller War Plants Corp., Washington, D. C., has released a booklet, "Spreading the Work," which fully discusses the corporation, its functions, powers and nation-wide organization, as well as its close relationship with the procurement services and American industry.

TAPPING Tapping machine No. 0, with capacities of No. 0-80- to 8-32-in. steels, is described, its uses pictured and its statistics given in a file-size booklet published by the maker, Bakewell Mfg. Co., 2023 Santa Fe Ave., Los Angeles 21, Calif.

TEMPLET DIES A 4-page, 2-color illustrated Bulletin No. T-43 describing its process of manufacturing blank and pierce templet dies has been released by Algoma Products, 3080 E. Outer Drive, Detroit 12, Mich.

TIMERS Condensed catalog No. 1, published by the R. W. Cramer Co., Centerbrook, Conn., describes, pictures and gives the functions of that firm's entire line of timers.

TOOLS The Delta Mfg., Milwaukee, Wis., has issued a catalog showing the 1943 line of production machine tools and woodworking production tools and accessories. It has 52 pages of illustrations and detailed information on power tools.

WIRE ENAMELING Booklet No. 8728, available from the General Electric Co., Schenectady, N. Y., describes wire enameling systems manufactured by that company for the application of Formvar and other enamels.

WRENCH The "Livermont Torg-Snap Wrench," which is "pre-set to the proper load for the nut it is designed to fit," is described, pictured and priced in a folder issued by the manufacturer, Tubing Seal-Cap, Inc., 215 West Seventh St., Los Angeles, Calif.

SEEN and HEARD

By JOHN R. GODFREY

We Didn't Build It!

Methods of handling subcontracted machines vary widely. Many prime contractors divide their work so that no subcontractors make enough of the machine to become thoroughly familiar with it as a whole. A few have complete machines built outside but have them torn down, carefully inspected and run-in at the home plant to insure everything being O.K.

One well-known concern has adopted an entirely different procedure. It has contracted with outside concerns to build certain sizes of complete machines. But, in addition to the name of the firm originating the machine, the bed casting also carries the name of the subcontractor.

These machines are well built according to specifications and inspection. But should dissatisfaction develop at any time in the future, the original builder has an "out". "That machine," he can say, "was built by one of our subcontractors during the war, as you can see. Most of them have proved entirely satisfactory. But the builder naturally lacked our long years of experience. We will, of course, service the machine the same as though we had built it ourselves."

Such a plan may have advantages in the years to come.

An Old Machine Wins Out

The radial drill with the universal arm seems to have gone out of date but I saw a case the other day where one of this type helped out on war job production. There was a lot of drilling both vertical and horizontal. With this machine holes in both directions could be drilled at the same setting by mounting work on a revolving table. It saved a lot of handling.

WHAT'S AROUND THE CORNER?

This question never was an easy one to answer. And a Global War doesn't make the answers any easier to find.

Yet, to many executives, as far as their own businesses are concerned, it is not unanswerable.

Some, with completely converted plants are now planning to get back into their former fields. They are redesigning their old products . . . utilizing new processes, new methods and new materials. They are laying plans for revamping their facilities to the postwar job.

Others have discovered new product opportunities in their war production setups. They plan to utilize the "know-how" which they have developed during the war.

Still others are making equipment surveys. They know that changes made for war production will affect their carefully planned peacetime equipment balance and influence a decision as to the volume of prewar products to be included in postwar production plans.

In such studies, management has often discovered the real value of the outside viewpoint. Our organization, because of its background of broad and unusual experience, has been helpful. May we discuss postwar planning with you?

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

GENERAL OFFICES · CLEVELAND · BULKLEY BLDG.
CHICAGO · City National Bank Bldg. · 208 S. La Salle Street
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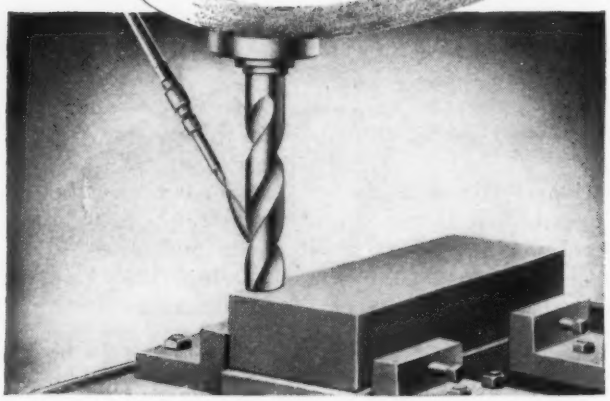
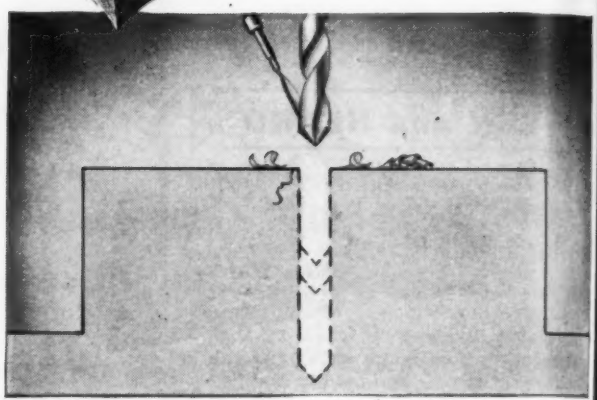
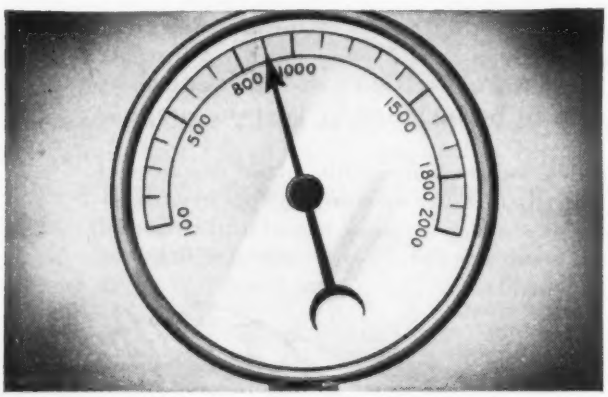
Helpful Hints for Drilling Tough Steel



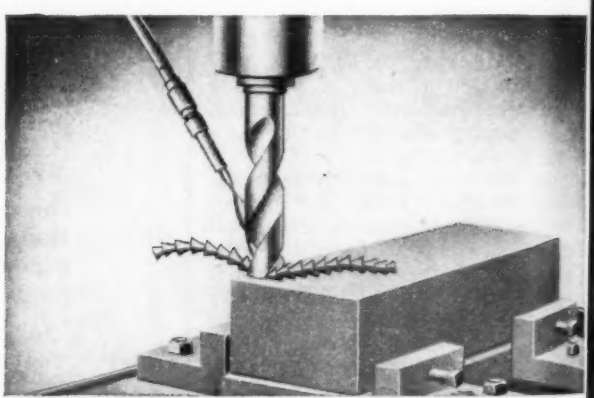
1. Use steady pressure and do not let drill ride without cutting. Back out the drill frequently to relieve chip congestion.



2. Back out when the drill has reached a depth three to four times the diameter of the drill for first insertion—one to two for second insertion—three to four for third.



3. To avoid drill breakage, always run at the proper speed. A 1/16" center drill should run about 1800 r.p.m. (30 s.f.m.). A 1" drill at 115 r.p.m. for same surface speed.



4. For deep drilling use a short spiral drill and Chillo No. 140 or 143, cut back with Amplex No. 00, further to reduce high temperatures. For shallow drilling use Chillo No. 90 or 93.

5. If you are faced with an unusual machining operation or if you are not satisfied with present results, call in a Cities Service lubrication engineer for consultation. His experience with Cities Service precision-made cutting oils on all kinds of machining operations is certain to help you as it has others. There is no obligation. For a copy of an informative booklet, "Metal Cutting Lubrication," write to Cities Service Oil Company, Room 1655, Sixty Wall Tower, New York 5, N. Y.

OIL IS AMMUNITION—
USE IT WISELY!

CITIES SERVICE OILS — ORCI-ALWAYS

CITIES SERVICE OIL COMPANY
NEW YORK · CHICAGO

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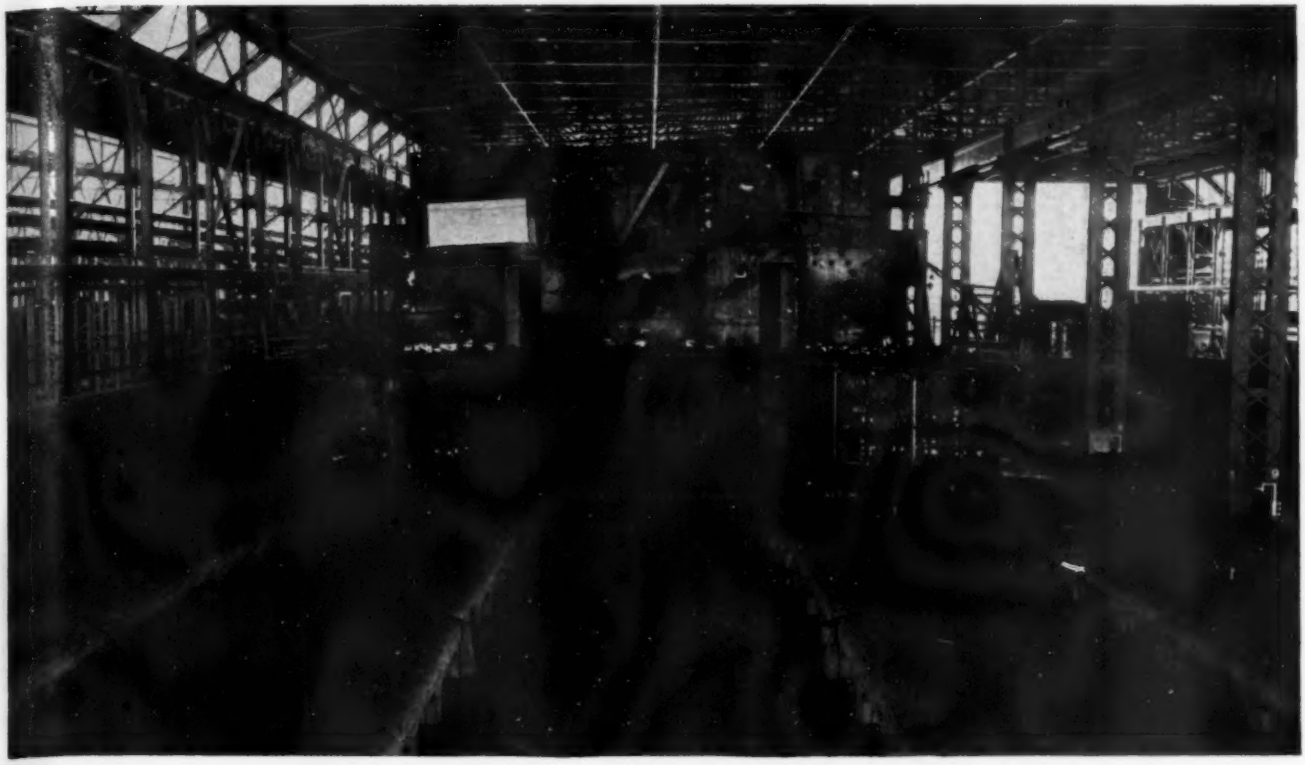
ARKANSAS FUEL OIL COMPANY
SHREVEPORT, LA.



Kaiser *Ship production* rolls on *Meehanite* rollers

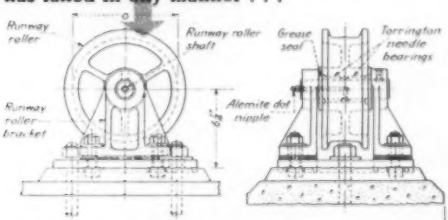
These **Meehanite** *foundries are ready to serve you NOW!*

ALLENTOWN, PA.	Traylor Engineering Company
ANSONIA, CONN.	Farrel-Birmingham Co., Inc.
BIRMINGHAM, ALA.	Continental Gin Co.
BRIDGEWATER, MASS.	The Henry Perkins Co.
BROOKLYN, NEW YORK	E. W. Bliss Company
BUFFALO, N. Y.	Pohlman Foundry Co., Inc.
CHARLESTON, W. VA.	Kanawha Manufacturing Co.
CHATTANOOGA, TENN.	Ross-Meehan Foundries
CHICAGO, ILL.	Greenlee Foundry Company
CINCINNATI, OHIO	Cincinnati Grinders Incorporated
CINCINNATI, OHIO	The Cincinnati Milling Machine Co.
CLEVELAND, OHIO	Fulton Foundry & Machine Co.
DENVER, COLO.	The Stearns-Roger Mfg. Co.
DETROIT, MICH.	Atlas Foundry Co.
FLINT, MICH.	General Foundry & Mfg. Company
HAMILTON, OHIO	The Hamilton Foundry & Machine Co.
HAMILTON, ONTARIO, CANADA	Otis-Fensom Elevator Company
IRVINGTON, N. J.	Barnett Foundry & Machine Co.
JEANNETTE, PA.	Elliott Company
LOS ANGELES, CALIF.	Kinney Iron Works
MILWAUKEE, WIS.	Koehring Company
MT. VERNON, O., GROVE CITY, PA.	Cooper-Bessemer Corporation
NEW ROCHELLE, N. Y.	Meehanite Metal Corporation
NEW YORK, N. Y.	The American Brake Shoe Co.
OAKLAND, CALIF.	Vulcan Foundry Company
ORILLIA, CANADA	E. Long, Ltd.
PHILADELPHIA, PA.	H. W. Butterworth & Sons Co.
PHILADELPHIA, PA.	Florence Pipe Foundry & Machine Co., (R. D. Wood Company, Selling Agents)
PHILLIPSBURG, N. J.	Warren Foundry & Pipe Corp.
PITTSBURGH, PA.	Rosedale Foundry & Machine Co.
PORTLAND, OREGON	Crawford & Doherty Foundry Co.
ROCHESTER, N. Y.	American Laundry Machinery Co.
ST. LOUIS, MO.	Banner Iron Works
ST. PAUL, MINN.	Valley Iron Works
SEATTLE, WASHINGTON	Washington Iron Works

ASSOCIATED COMPANIES

LONDON, ENG.	The International Meehanite Metal Co., Ltd.
WATERLOO, N. S. W.	Australian Meehanite Metal Co., Ltd.
JOHANNESBURG, SOUTH AFRICA	Meehanite Metal Co. (S.A.) (Pty.) Ltd.

Again, Meehanite has been called upon to fulfill an exacting assignment. For the pre-fabrication of Liberty Ship Sections at the Kaiser-managed Permanente Metals Corporation Shipyard at Richmond, heavy-duty rollers were needed in a hurry. Meehanite was selected because it could be furnished promptly with the high strength and other physical properties needed for the job. The installation has been in operation for some time, and a recent report says . . . "The Meehanite rollers have proved 100% efficient and not a single one has failed in any manner . . ."



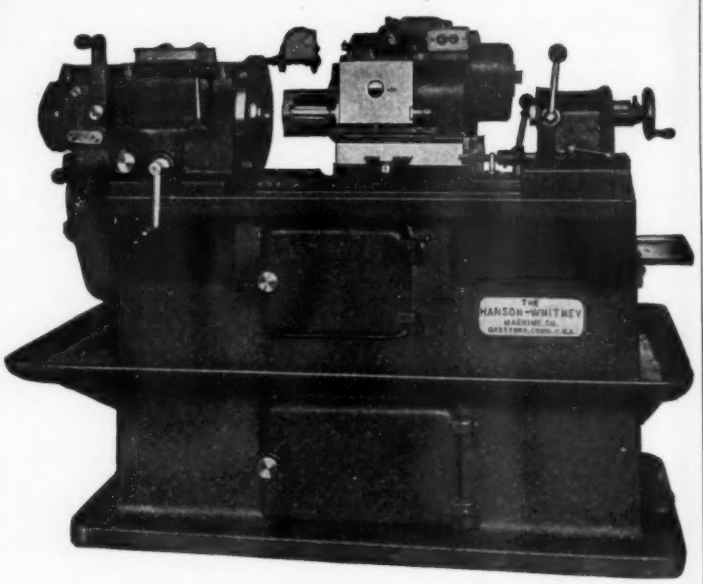
If you are interested in knowing about the engineering and physical properties that can be obtained — dependably — in Meehanite, contact the nearest Meehanite Foundry or write us direct!

Ask for the MEEHANITE HANDBOOK.

MEEHANITE
research institute
NEW ROCHELLE, N. Y.

Across the Pacific

Victories are won by superior equipment. H-W Semi-Automatic Thread Milling Machines are winning production victories . . . by saving precious time in thread production . . . by minimizing spoilage . . . by securing highest precision on difficult work. The H-W Milling Process employs multiple cutters that finish threads in one revolution . . . producing internal, external or taper threads . . . right or left hand . . . with equal speed, facility and precision. If you have a threading problem, call Hanson Whitney.



ARMY E NAVY

THE HANSON WHITNEY MACHINE CO.

HARTFORD CONNECTICUT U.S.A

This "BIG STICK Policy" ups production 140%

Teddy Roosevelt had a good idea in 1901 when he advised, "carry a big stick, and you'll go far."

Yes, by today's arc welding standards that "Big Stick Policy" is still good.

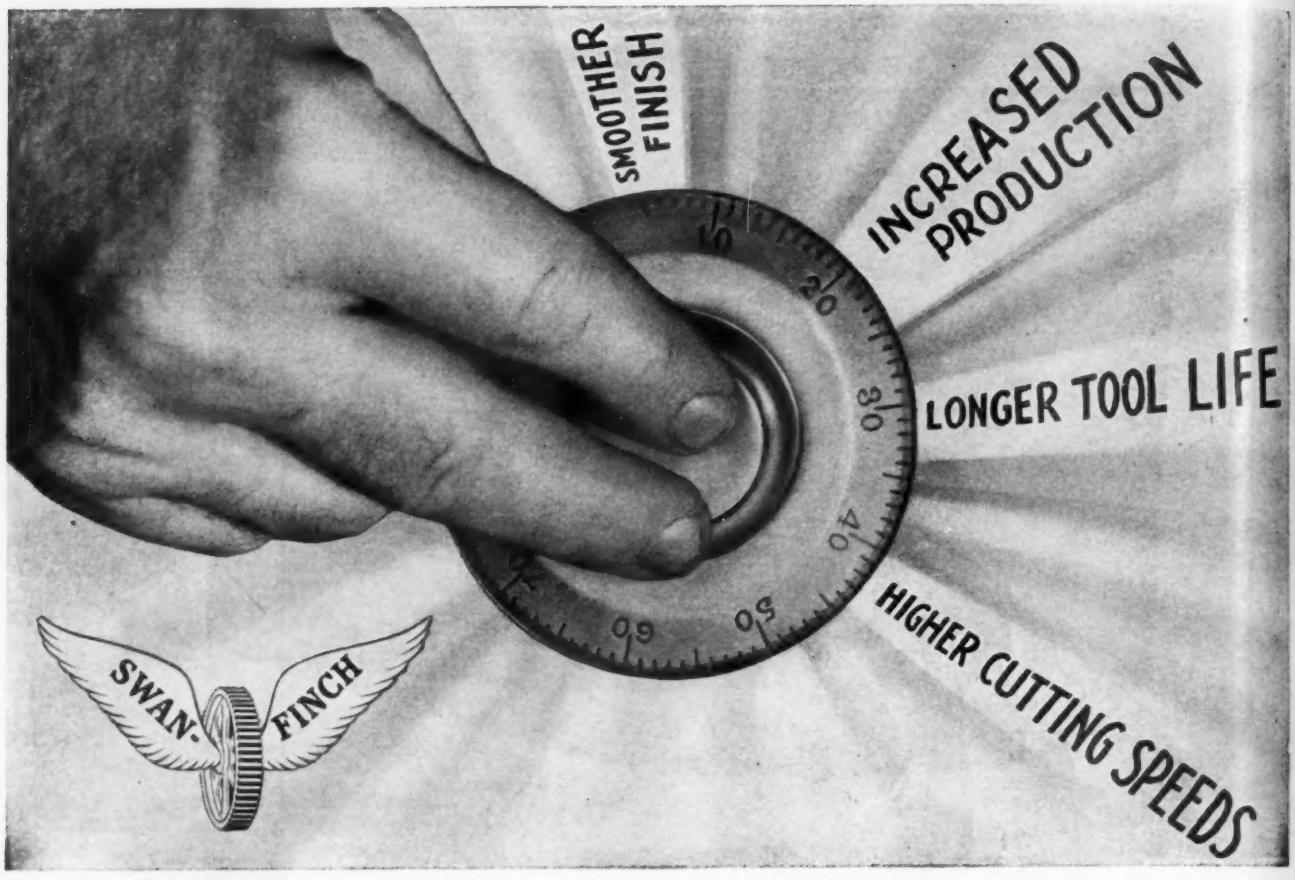
Right! USE THE BIGGEST POSSIBLE STICK OF ELECTRODE, AND YOU'LL GO FAR.

Look what they're doing in this shop. By boosting electrode size, output of tank track sections was increased like this:

Size "Fleetweld" Electrode	Parts Welded Per Hr.
1/8"	10
5/32"	17
3/16"	24

Swell! 3/16" electrode may not be a giant but it got "big stick" results here . . . an output increase of 140%. Some shops are boosting electrode size up to 3/8". It all depends on the nature of your work. You can get "big stick" advice from Lincoln.

THE LINCOLN ELECTRIC COMPANY
Cleveland, Ohio



SAFCO METAL WORKING LUBRICANTS

Right Combinations for increased production!

Right combinations of ingredients in metal working lubricants are like the right numbers on the dial of a safe, each one vital for opening wide the doors of production.

Swan-Finch 'SAFCO' metal working lubricants are combinations that have been continuously proved as scientifically correct.

Today high production schedules and precision specifications do not permit guesswork.

Swan-Finch, the makers of 'SAFCO', are lubrication specialists in the metal working field.

That's why more important plants engaged in vital war production are testing and specifying 'SAFCO' lubricants.

It will pay you real dividends to get better acquainted with the Swan-Finch field representative who covers your district. Capable and able, they are constantly devising *new* ways and means for stepping up production.

For instance meet Milton C. Knight. He is one of our highly trained and experienced staff of fieldmen.

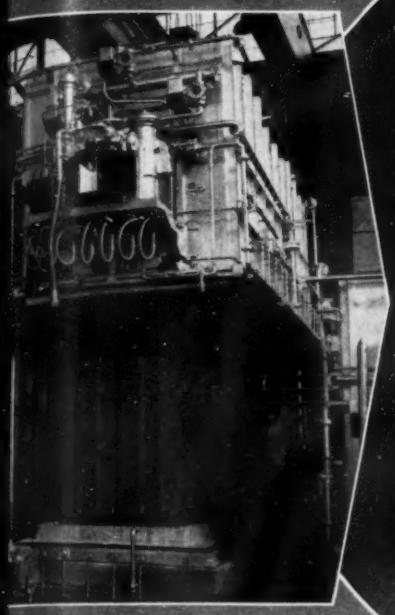
ASK US TO HAVE HIM CALL—NO OBLIGATION.

SWAN-FINCH OIL CORPORATION

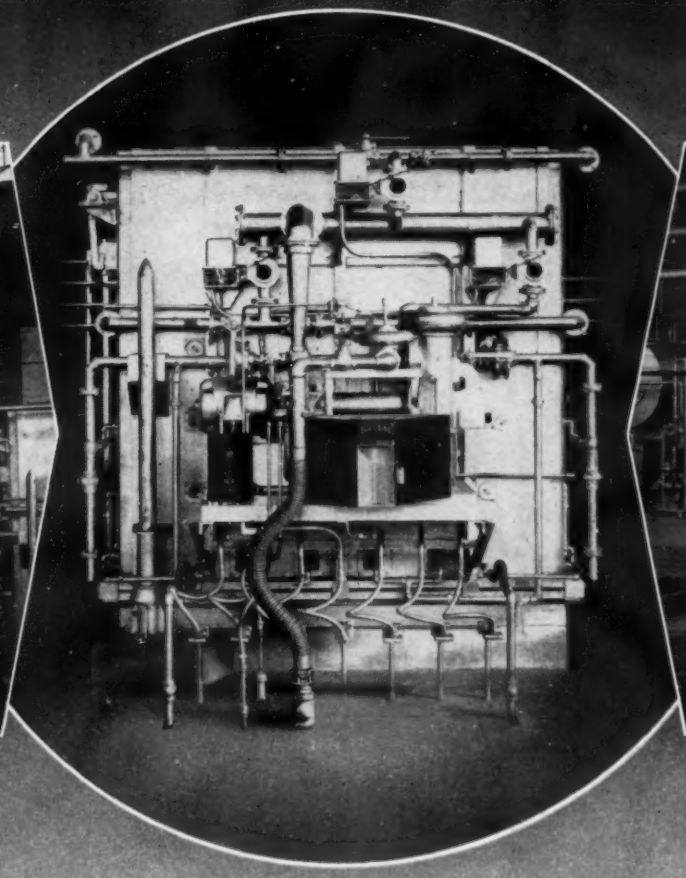
Offices		Plants	
New York City—Executive Offices	R.C.A. Building, West	Newark, N. J.	120 Lister Avenue
Chicago, Ill.	201 North Wells Street	Chicago, Ill.	5849 West 66th Street (Clearing, Ill.)
Detroit, Mich.	2596 Hart Avenue	Detroit, Mich.	2596 Hart Avenue

ANOTHER EXAMPLE OF SALEM ENGINEERING INGENUITY

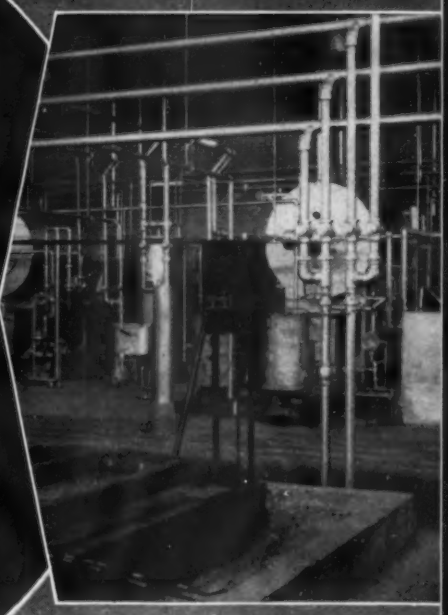
ATMOSPHERE ANNEALING WITH DIRECT FIRING



Here the heating hood is raised, showing the inner cover under which the charge is placed. After the heating-soaking cycle is completed, the hood may be removed and placed on another charge, leaving the inner cover in position until the charge has finished cooling.



This shows the heating hood in place with thermocouples and fuel connections ready for operation. Notice the careful, clean-cut engineering construction.



SECO Gas Generator and Hot Purge Units are shown here. Having a capacity of 3,000 c. f. m., this equipment produces protective atmosphere of various compositions, each with its especial, correct analysis for any annealing purpose.

This Salem, direct-fired, protective-atmosphere annealing furnace will anneal high-carbon and low-carbon steel—bars, sheets, and strip. It is now being used to anneal SAE–52100 steel. Precisely controlled compositions of atmosphere may be varied to produce the correct analysis for each individual charge. Fired with gas at an operating temperature of 1450° F., this furnace has a capacity of 40,000 pounds of bar stock in one charge. The heating-soaking-cooling cycle is 20 hours.

Because Salem's method of direct-firing utilizes the full value of the heat, this furnace lowers cost of production and maintenance. The ingenious placement of Salem direct-firing burners creates swirling currents of heat which bathe the entire charge. This results in elimination of hot spots and provides precision controlled uniformity of temperature. Salem can help you solve any phase of your heat treating problems from design and engineering to building of equipment.

SALEM ENGINEERING COMPANY

SALEM ENGINEERING CO. · SALEM, OHIO

SAVE HOURS OF TRAINING
for your Screw Driving Army

PHILLIPS SCREWS ARE FOOL-PROOF!

Light-fingered and feminine . . . heavy-handed and he-man . . . raw recruit or veteran. All can be put on a high-production level on your assembly line by giving them Phillips Recessed Head Screws.

The scientifically designed Phillips Recess automatically centers the driving force and eliminates all driving troubles . . . fumbling, wobbly starts . . . slant-driven screws . . . burred and broken screw heads . . . and dangerous screw driver skids.

Screw and driver "become one unit", making such efficient use of turning power that driving is much easier and faster, regardless of driving method. And, power driving is made practical in most cases.

They cost less to use! Compare the cost of driving Phillips and slotted head screws. You'll find that the price of screws is a minor item in your total fastening expense . . . that it actually costs less to have the advantages of the Phillips Recess!

KEY TO FASTENING SPEED AND SAFETY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving – Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

Better Fastenings – Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BO

21 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Co
Whitney Screw Corp., Nashua, N. H.

COLMONOY No. 4

HARD FACING ALLOY

RESISTS SEVERE WEAR IN DIESEL ENGINE VALVES

● Diesel engine valves, in locomotive service, must take a lot of punishment. Roadbed cinders and dust caused these valves to fail in service, wearing down rapidly and losing compression. To salvage the valves already on hand an undercut was made as shown in the illustration on the left.

COLMONOY No. 4 was applied in the undercut by oxy-acetylene welding, and subsequently machined and ground. Due to the low temperature at which the application was made there was absolutely no distortion in the valves.

Service records show that the great abrasion resistance of COLMONOY completely solved the problem of wear.

There is a grade of COLMONOY for every hard facing need. If you have a wear problem, COLMONOY engineers will be glad to make recommendations and suggest proper methods of application.

WALL-COLMONOY CORP.
920 Fisher Building, Detroit
Branch offices in New York City, Hasdell, N. Y., Chicago, Tulsa, Los Angeles and in Canada.

COLMONOY

HARD FACING ALLOYS AND OVERLAY METALS

WALL-COLMONOY CORPORATION—DETROIT

NICKEL AIDS THE FARM IMPLEMENT INDUSTRY

to KEEP 'EM SERVING!

America won a victory on the food front in 1942 with production that reached an all-time high. But even that wasn't enough to feed a hungry, war-torn world. So this year's objectives are higher.

Farmers need mechanical equipment to produce food in winning quantities. Now, with the critical shortage of skilled farm labor, modern machinery becomes vitally important.

Agricultural equipment engineers have steadily improved farm machinery, lowered costs, and educated users. Result: no nation's farms were ever so fully mechanized as ours. And repair and service facilities have kept pace so farm equipment keeps working without excessive breakdowns or delays.

The foresight of these engineers is shown by their repeated specification of materials strengthened and toughened with Nickel. Their experience proves that a little Nickel goes a long way in the manufacture of parts that stay on the job . . . stressed parts that stand shock overloads.

From tractor transmissions to plow discs, from cylinder liners to bull gears, Nickel teams up with other metals to assure the dependable performance of farm implement parts.

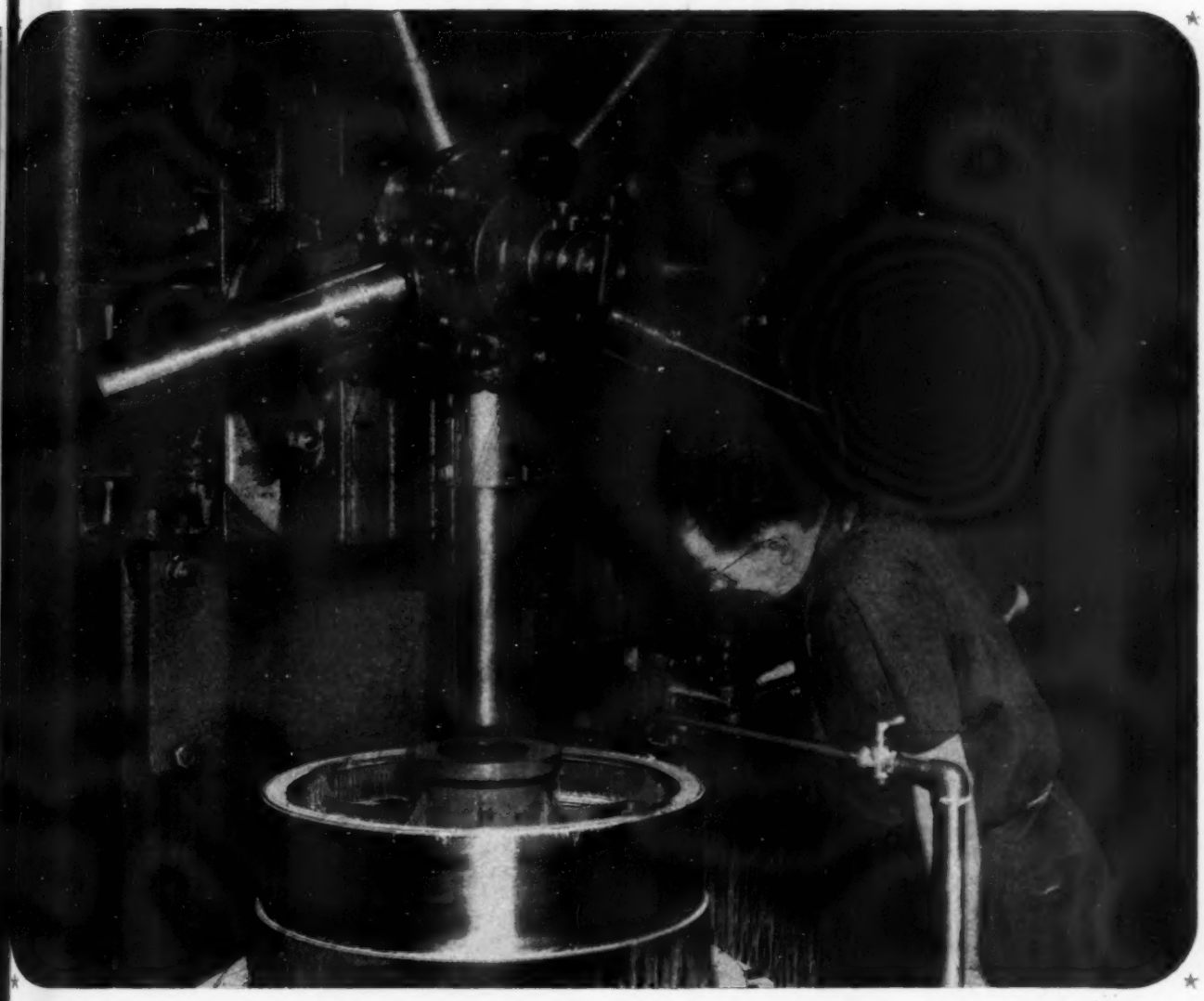
For years, the technical staff of International Nickel has been privileged to cooperate with the engineers and production men who are responsible for such great achievement in the improvement of farm equipment . . . equipment now working at top speed to feed the United Nations. INCO's staff of engineers and metallurgists offers counsel and data to all who seek assistance in the selection, fabrication and heat treatment of ferrous and non-ferrous metals.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects — from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

★ *Nickel* ★

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*



THERE'S MORE THAN ONE SHOT IN THE TOOL STEEL MAGAZINE

FOR every machining job, there is a tool steel which will produce optimum results as regards the amount of work done per machine hour and per grind.

Teaming up the right tool steel with the job frequently shows phenomenal improvement. For instance, with a connecting rod broach made of DBL High Speed Steel, a well-known engine builder secured 13,533 pieces for the life of the broach, against a previous best average of 8000 pieces. The increase is almost 70%. A similar company, using 3/8" twist drills made of DBL, secured an average of 30% more holes per grind than with 18-4-1.

War production calls for the best possible performance from every machine tool, new or old. Let our engineers help you to determine the right tool steels to use on your jobs, for improved results. They'll also acquaint you with the best *alternate* steel, for your protection in possible future shortnesses of supply.

WRITE DEPT. AM-

Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

A-8839 . . . W & D

You tap a NEW source of production efficiency when you DEGREASE AND CLEAN your war products the FAST OAKITE WAY!

IN PREPARING ordnance and other war supplies for plating, lacquering, painting or black oxide finishing . . . or for anodizing, galvanizing, the Bullard-Dunn Descaling Process or Dow surface treatments . . . specialized Oakite alkaline, emulsifying, acid and solvent-type cleaning materials help you tap a NEW source of production efficiency!

Used in automatic machines or tanks, these dependable materials keep production UP and rejects DOWN by thoroughly, speedily removing oil, grease, smut, soldering fluxes, polishing and buffing compounds, identification paint...put parts in the CHEMICALLY CLEAN condition that wartime QUALITY finishing operations demand! See list below for types of war products on which Oakite materials are being specified and used by prime and sub-contractors.

Oakite Technical Service FREE!

Whether or not you use Oakite materials, ALL our facilities . . . our Nation-Wide Field Service Staff, our Technical Laboratories, our 34 years' experience . . . are FREELY AVAILABLE to expedite and speed-up your production cleaning operations. Your inquiries invited . . . and promptly answered.

IS THE WAR SUPPLY ITEM YOU ARE PRODUCING LISTED HERE?

A wide range of specialized Oakite materials is available to meet every production degreasing or cleaning specification on war orders. Warehouse stocks maintained in key industrial centers.

AIRPLANES
AIRPLANE MOTORS
FLIGHT INSTRUMENTS
AIRPLANE PARTS
BOMB FIN ASSEMBLIES
BOOSTER CAPS
FUZES & FUZE PARTS

POWDER BOXES
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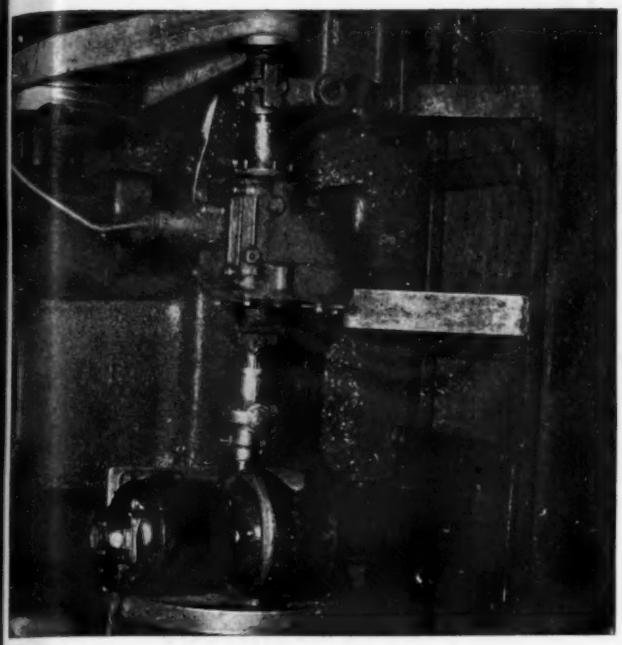
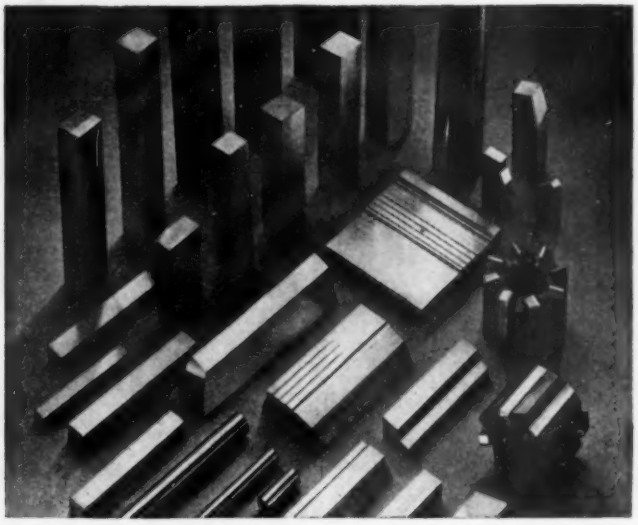
OAKITE
MATERIALS...METHODS...SERVICE

CLEANING
FOR EVERY CLEANING REQUIREMENT

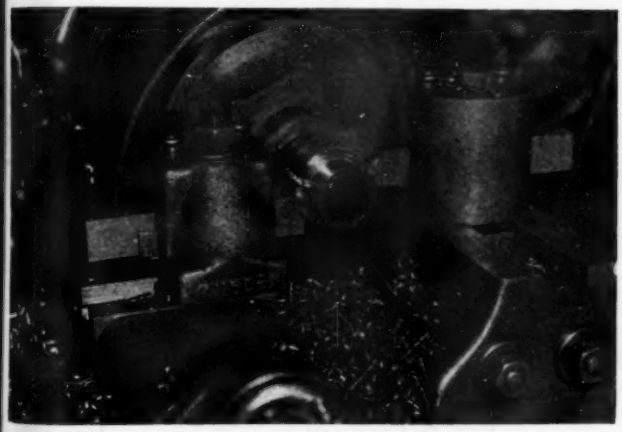
HOW TO SOLVE TOOL PROBLEMS



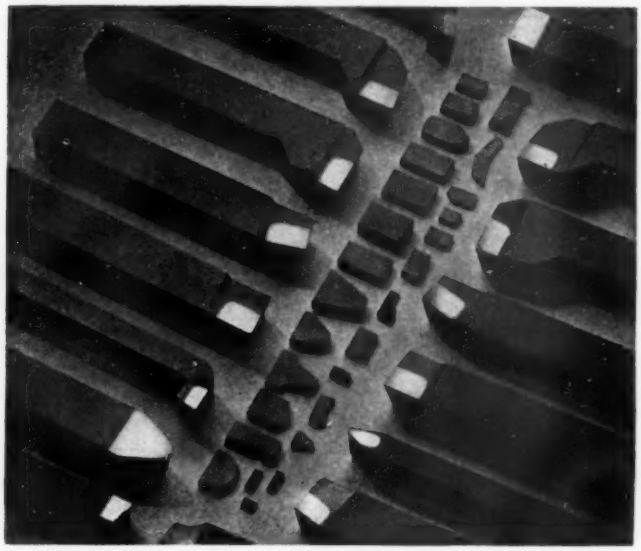
It Takes ingenuity to convert an old planer into a vertical miller, but that's just what they did at the Kerrihard Company in Red Oak, Iowa. They used a cream separator and a Model T transmission. Then they changed from high speed steel to Tantung. Results: 25% increase in speed, 1200% increase in tool life! Tantung is *tough;* gets top efficiency from old machines!



Tantung, the *only* cast, non-ferrous alloy containing tantalum carbide, wears from 2 to 25 times as long as high-speed steel. It has a red hardness far above that of any steel, and Tantung's self-lubricating action minimizes chip wear or "cratering." If you're using high speed steel tools now, switch to Tantung and then watch your production jump—your tool life lengthen!



Here's a new lathe, powered for carbide tools. The operator is cutting X4130 at 409 r.p.m. That's a typical carbide job, but this wise operator makes his work easier, surer, faster and cleaner by using only Ramet carbide tools. You can get better results, too, by changing over to Ramet carbides now!



The big difference between Ramet carbide tools and other kinds is this: Ramets are made with tantalum carbide. As in the case of Tantung tools, this means less chance of "cratering," a minimum of chip wear. For speed, dependability and *extra* service, you can't beat Ramet carbides. Specify them *from now on!*

VASCOLOY-RAMET'S COMPLETE TOOL SERVICE WILL SOLVE PRACTICALLY ALL MACHINING OPERATIONS. Naturally, you're interested in speeding up your production, cutting down idle machine time, producing more and better work in less time at lower cost. That's a big order, but you can do a lot towards filling it by using the Vascoloy-Ramet *complete tool service.* Replace high speed steel tools with modern, practical Tantung; install Ramet carbides wherever carbides are indicated. Then see—in your own production figures—what this better tool service does for you!

VASCOLOY Ramet RAMET CORPORATION

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JOHNS-MANVILLE JM PRODUCTS

You can now assure

A CONSTANT FLOW OF CLEAN CUTTING OIL TO EVERY MACHINE

Johns-Manville announces a simple, economical method for continuous clarification with . . .

CELITE FILTER AIDS

TO provide the perfectly clarified cutting oils demanded by today's high-speed, precision standards, J-M Filtration Engineers have developed a simple, economical method for keeping *clean* oil flowing on cutting surfaces at all times. This new process, involving the use of Celite Filter Aids in conjunction with any standard filter, makes it possible to remove all metal particles and other foreign matter from the oil—leaving it as clean as when it came from the refinery.

Result: eight outstanding production advantages as listed at the right.

Celite is immediately available through 20 stocking points strategically located throughout the country. For a list of these stocking points and for full details, send for Celite Filter Aids folder FA-23A. Samples and prices available on request. Address Johns-Manville, 22 East 40th Street, New York, 16, N. Y.

CELITE

HAS THESE 8 OUTSTANDING ADVANTAGES

1 Can be used in any standard type pressure or vacuum filter.

2 Increases tool life.

3 Saves on labor ordinarily needed for tool changing and sharpening.

4 Safeguards precision tooling by making possible more closely dimensioned and smoother-surfaced work.

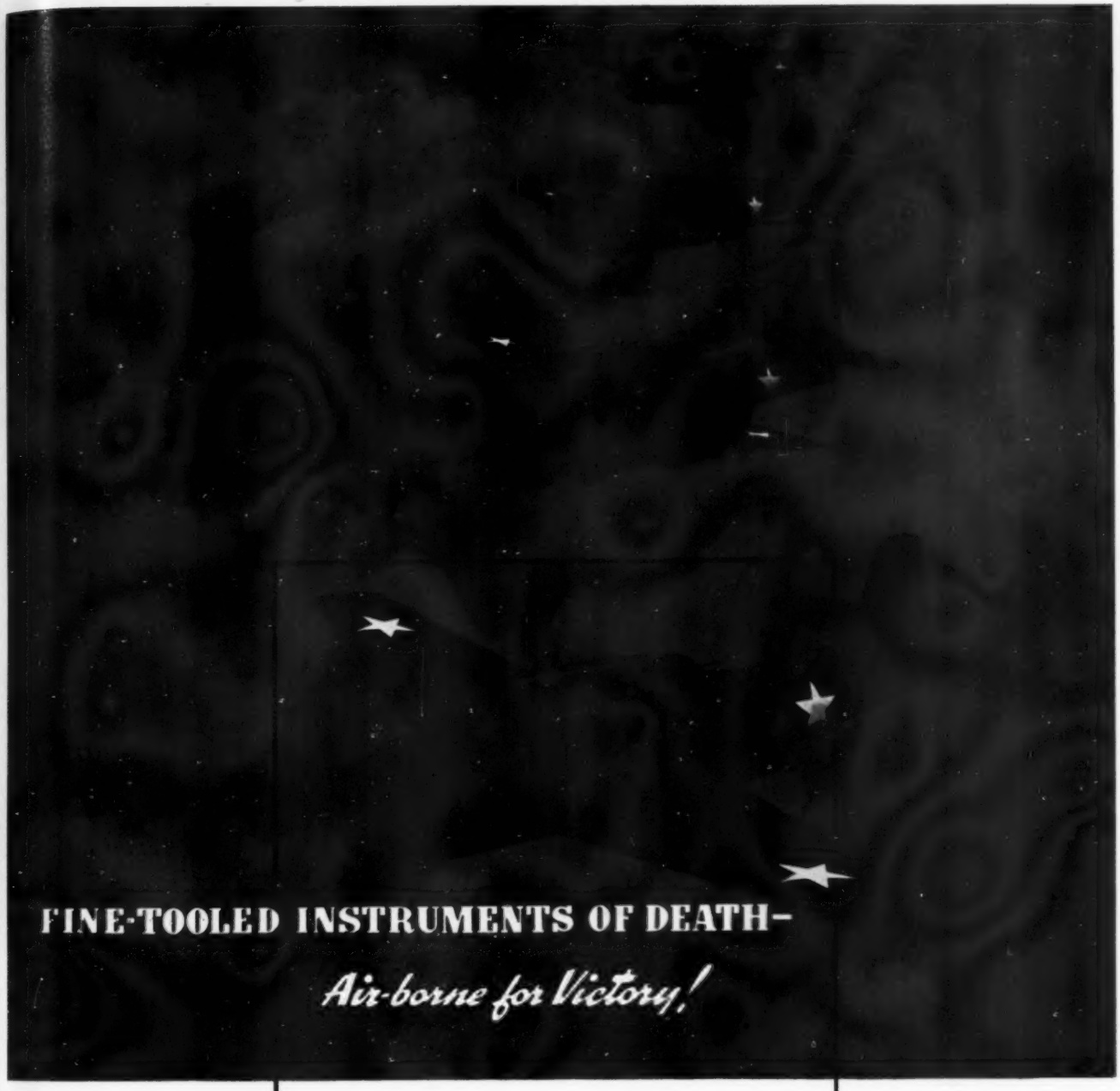
5 Cuts down on rejects.

6 Saves oil which otherwise would be discarded.

7 Does not remove soluble additives contained in many new oils.

8 Reduces incidence of skin infection.

JOHNS-MANVILLE
CELITE FILTER AIDS



STEELS that give form to metal—forging, pressing and stamping an endless flow of parts . . . Steels that cut and finish to sharp precision the vital units in our fighting planes . . . superior *Tool Steels* that contribute to aerial victory, and to the winning of the war on *every* front.

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METEX COOLANT STRAINER

THE INEXPENSIVE EFFICIENT COOLANT STRAINER

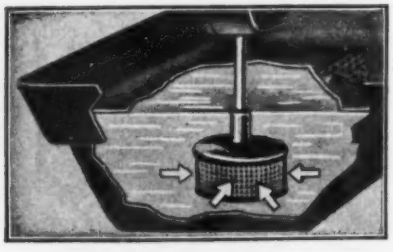
(U. S. Pat. 1676191—Other Pats. Pending)

Cylindrical Type

Adaptable to most Machine Tools...all easily installed, vertically or horizontally, singly or in multiple.

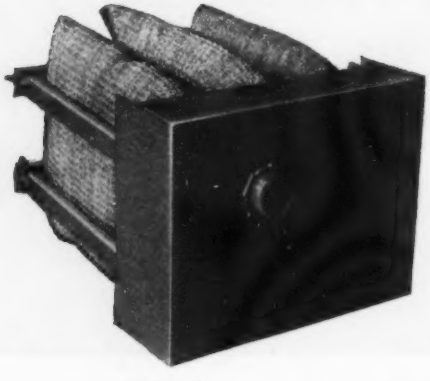
MODEL C

- **Cylindrical Type (size adapted to most machines). Diameter—5" . . . Overall Height—4 5/32" including coupling. Capacity up to 10 G.P.M.—¾" pipe. *Other sizes, surface areas and capacities, this type, Model* A, B and D.**



Typical Installation

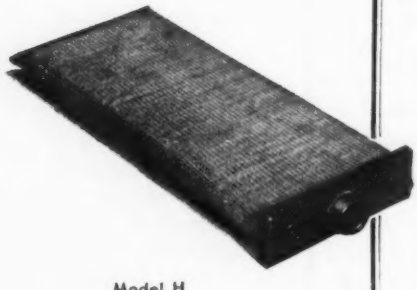
Metex Coolant Strainers in machines equipped with gear pump coolant systems (or centrifugal pumps that have an intake pipe extending into the tank) will strain chips and slag remaining in suspension, save pumps, gears, unnecessary machine wear, and will boost and maintain production.



Model G

MODEL G and H *(Oblong Type)*

- Are constructed to remove fine residue (grindings, etc.) from the coolant fluid. Same installation as Cylindrical Type. While designed particularly for grinders and automatic screw machines, will give efficient service in all machines. Model H is especially adapted to those with shallow or narrow sumps.



Model H

BUY THEM BY THE DOZEN

Your machines are working on a 'round-the-clock production program. The coolant, being continually agitated, does not have a chance to settle, so you need the protection of these strainers NOW. Buy them by the dozen so as to have a supply in your stockroom to be installed when pumps are being repaired or replaced, or when machines are down for a short time.

Distributed by leading Mill Supply Wholesalers or direct from

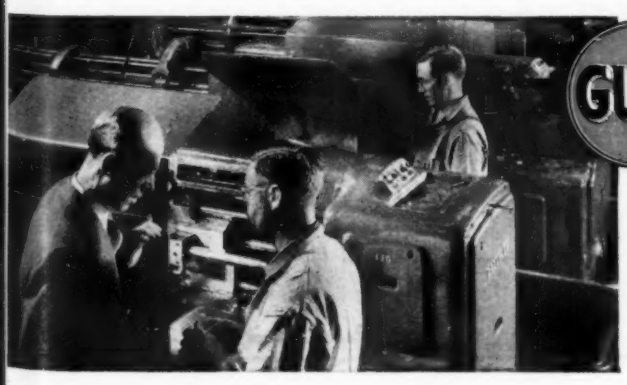
METAL TEXTILE CORPORATION 4 Central Avenue, Orange, N. J.

Let proven superior performance of Gulf Cutting Oils in over 1,000 war production plants be your guide to improved machining practice — call in a Gulf Lubrication Service Engineer for a conclusive shop demonstration.

Experience with Gulf Cutting Oils in over 1,000 war production plants brings this fact into sharp relief: A new yardstick is needed to estimate machine tool performance when the proper Gulf Cutting Oil is selected for a particular job!

In plant after plant, Gulf Cutting Oils have set new standards for production, tool life, and work finish—up to 400% increase in production per machine, up to 2,000% longer tool life, and extremely interesting improvements in finishes.

It will pay you to investigate these superior cutting oils—call in a Gulf Lubrication Service Engineer now and let him demonstrate their unique properties, which have proven so outstandingly successful for machining all types of metal parts. He can help you improve *your* machining practice.



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Please send me, without obligation, a copy of the new revised booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

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Company .....

Title .....

Address .....

Somewhere a SOLDIER may be waiting

There may be a soldier waiting somewhere—waiting for material that's late because of a production letdown back home. A few tools "down" on the production line didn't matter much a few years ago. But it does today—for each tool must be producing vital material with minimum loss of down time for regrinding. There is no room for "Tool absenteeism".

The high quality that has identified Jessop High Speed Tool Steels for 42 years is saving vital time by giving longer tool life and more production between grinds. In order that Jessop High Speed Tool Steels may be produced in greater quantities, new electric melting furnaces, rolling equipment, and subsidiary facilities have been installed in our mills. We will be glad to consult with you regarding the availability and application of Jessop High Speed Tool Steels to aid *you* in speeding production.

Jessop Steel Company

Head Office and Works

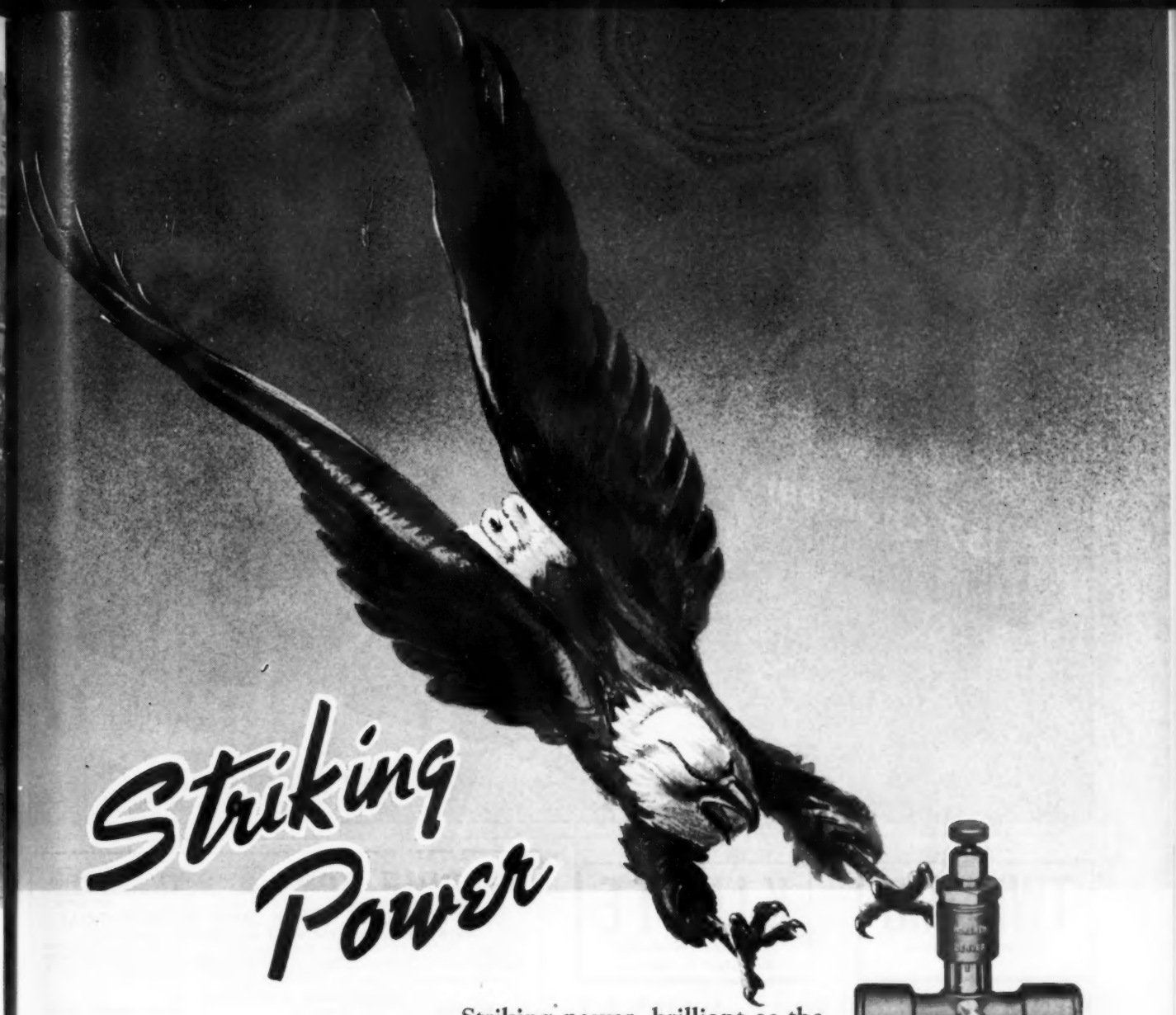
Washington, Pa.

Supremus, Purple Label, Purple Label Extra, Mustang, Mustang Special, and Mogul are brand names of Jessop High Speed Tool Steels.

ARMY E NAVY

JESSOP STEEL CO. JESSOP STEEL WASHINGTON, PA.

Established 1901



Striking Power

Striking power, brilliant as the flash of a killing eagle, is built into every air tool by its builder. You can preserve that power indefinitely only by providing Norgren air-borne Lubrication—continuously! Investigate . . .

NORGREN air line LUBRICATORS

Install directly into air line. They inject exactly enough oil into the air stream to create an oil-air fog, lubricating every working part of the air tool.

Check wear in use. Stop destructive corrosion when idle. Automatic. Sight-feed. Save more than they cost in short order! Size and type for every purpose.

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CATALOG 400

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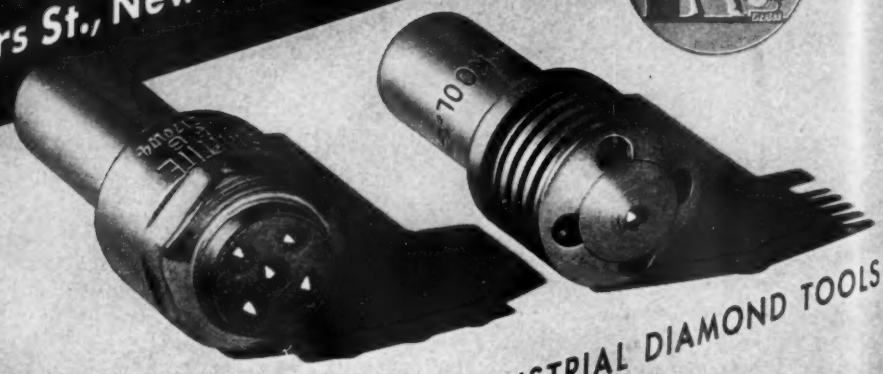

INDUSTRIAL DIAMOND TOOLS

TWIN-MO
The new high speed steel

KINITE
Alloy Air Hardening Bar Steel & Castings

N. BOKER & CO., Inc., 101 Duane St., New York, N. Y.

ALADDIN ROD

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DOES IT QUICKER, BETTER, MORE ECONOMICALLY
WELDS ZINC BASE DIE CAST and BRAZES ALUMINUM

Repairs KIRKSITE and other zinc base dies, with die in either horizontal or perpendicular position. Unexcelled for use on sheet or cast aluminum, saves time and heat. Complete instructions with each pound. Sizes 1/16", 1/8", 3/16" & 1/4" also complete assorted lb. WRITE FOR FREE LITERATURE.

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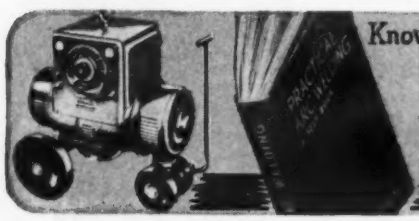

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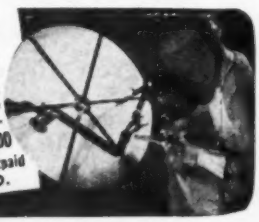

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Thred Kut "99"

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"Excelene"

. . . for Top Efficiency in Thread Grinding

STUART Thread Grinding Oils are in wide use, giving unequalled efficiency at nominal cost. Developed in co-operation with leading manufacturers of thread grinding machines and wheels, they have been proved in many of the largest and most modern metal working plants . . . A Stuart Oil Engineer will gladly help you achieve top efficiency in thread grinding. Ask him to come in.

For All Cutting Fluid Problems

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Warehouses in Principal Metal Working Centers

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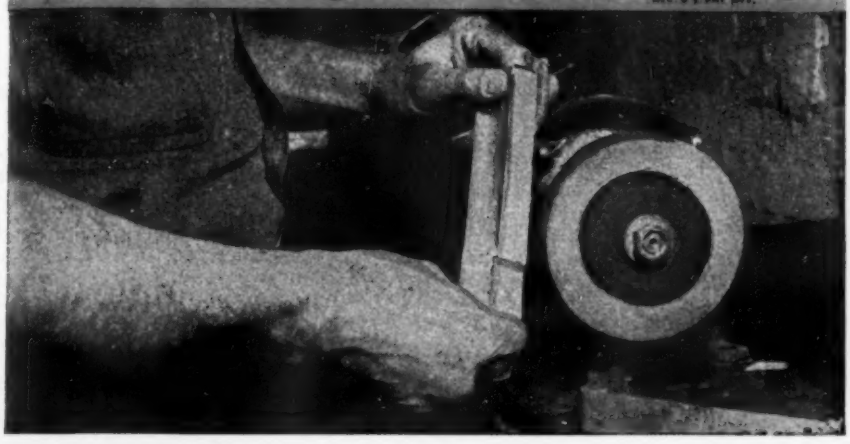

DE-BURRING *FASTER* MEANS BOMBING *SOONER*

● In plane construction, shipbuilding and countless other types of war material manufacture, Brightboy cuts hours of time and many in-between operations from de-burring, cleaning, finishing, polishing—gets the implements of war off the production line and into the firing line *faster!*

● Brightboy's resilient rubber binder *cushions* the abrasive. Degree of finish and polish achieved by regulation of machine speed; operations between a grind and a buff are eliminated. Brightboy requires no time-consuming "dressing". Works metals with minimum dimensional loss. Does not load, gum nor fill. Speeds up finishing after planing, cutting, punching; removes light tool, heat and weld marks, smooths up joints.

● Write us if your dealer cannot furnish you with "Methods and Applications" data, catalogs and prices. Our field representatives are at your service.

BRIGHTBOY INDUSTRIAL DIVISION

WELDON ROBERTS RUBBER CO., NEWARK, NEW JERSEY

WHEELS
BLOCKS
RODS
TABLETS

—for manual and machine operations

A Quick, Smooth, Uniform coating — assured by
BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With these new Barrett machines for expelling excess metal from small parts after dipping in molten metal, faster and better work is assured which will pass the most rigid inspection for quality.

The method of handling work is simple and easy. Work to be processed is placed in a basket and submerged in a kettle of hot molten metal. When thoroughly heated, the basket with the work is transferred into the Barrett Centrifugal where the basket is revolved and the excess metal thrown from the work. A quick pick up and stop (from 2 to 3 seconds each) assures fast work. Then too, quick pick up snaps the excess metal from the work before centrifugal action comes into play. With Barrett Equipment excess molten metal can be quickly thrown off before the metal cools, thereby assuring smooth, even thickness of coating.

Barrett Centrifugals for Galvanizing with and without heated drums are available in capacities from 40 to 240 loads per hour handling from 5 to 100 lb. loads. For tinning, Barrett offers the #0 Centrifugal Machine, operated similarly to the Galvanizers. On threaded work, tinning is so exactly done that rethreading is unnecessary.

Barrett Galvanizers, combining convenience of operation with the utmost in speed and safety are developed to meet the requirements of actual use by men thoroughly familiar with this class of work. They are self-contained and occupy the minimum of floor space.

Send at once for full details of Barrett Centrifugal Galvanizer

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

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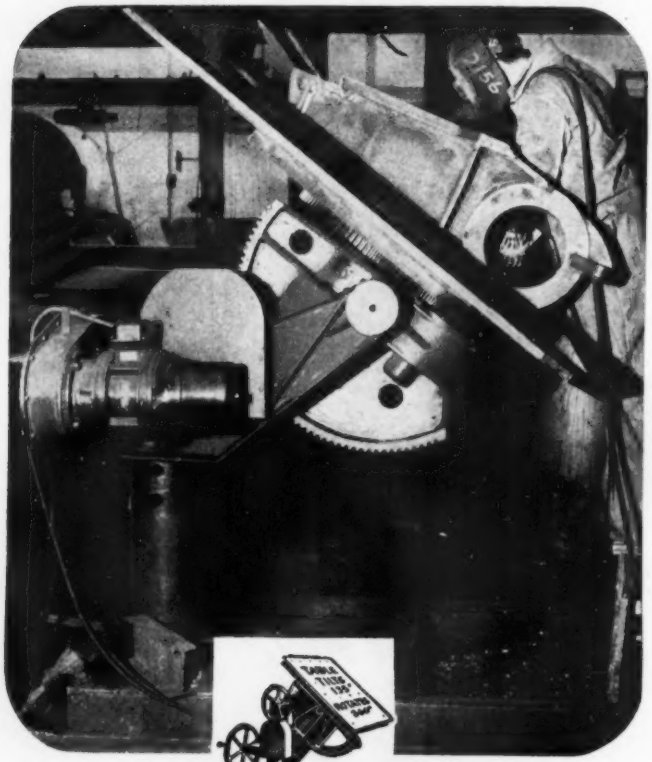


C-F POSITIONERS

Speed Production and Job Welding

★

C-F Positioners make welding a faster and more economical operation—save time, save manhours. The welder himself turns and tilts and positions even the clumsiest and heaviest weldments with a push button control—without cranes, crane crews, hoists, jacks or "flopping" space. All sides can be welded down-hand—all welds can be made faster with heavier rods; made stronger, smoother and flawless.

C-F Positioners come in sizes and types for every welding need—range from small hand operated units for light job work to giant positioners that swing great weldments weighing 30,000 lbs. All have platforms that rotate the full 360° and tilt to 135° beyond horizontal. *All are adjustable for height and are pedestal mounted to give greatest floor clearance.*

Write for Bulletin WP 22.

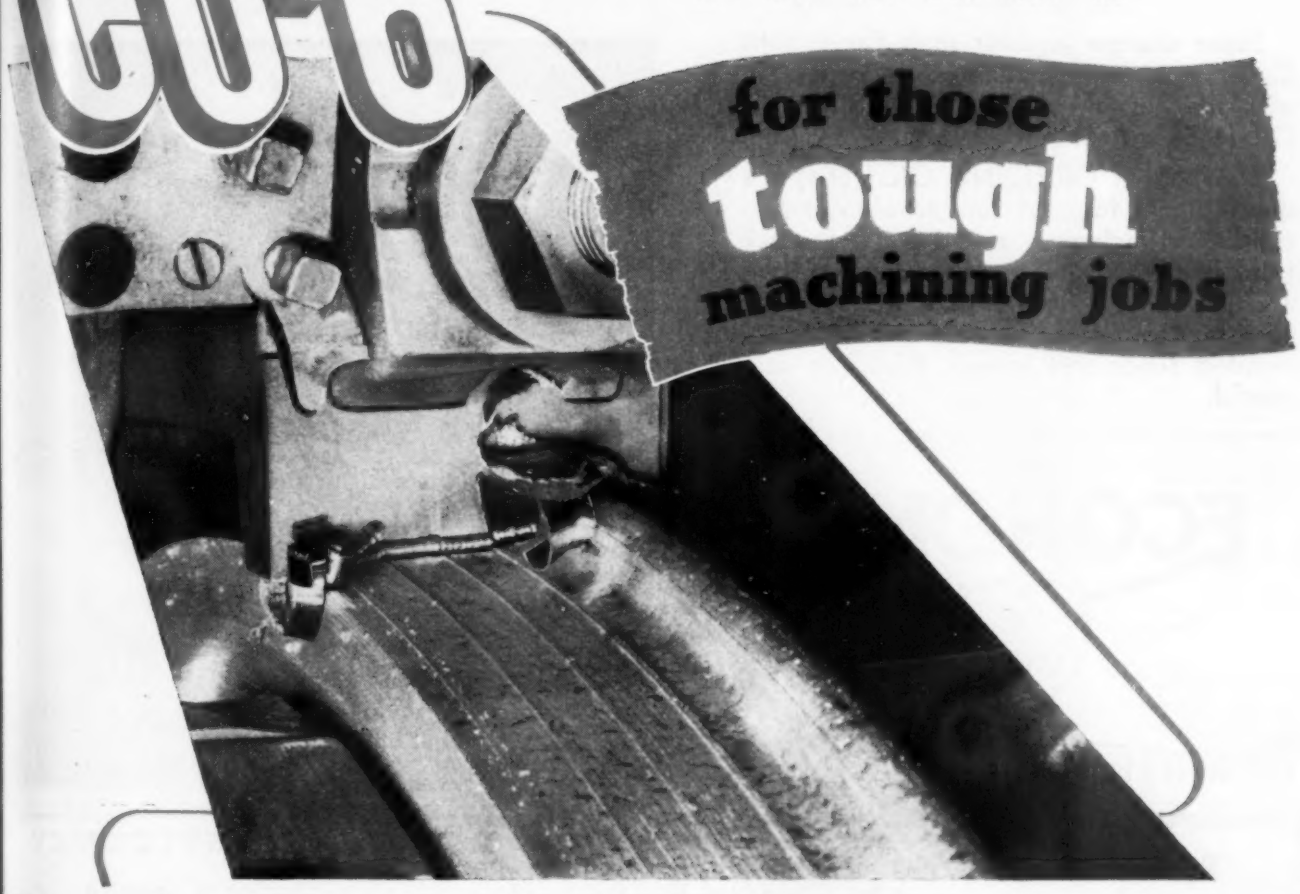
CULLEN-FRIESTEDT COMPANY

1313 S. Kilbourn Ave. Chicago, U. S. A.

CO-6

TYPICAL ANALYSIS

C	W	Cr	Va	Mo	Co
88%	5.50%	4.00%	1.75%	4.50%	9%



Resists wear and abrasion . . . increases efficiency . . . assures maximum production

In every plant there is a tough machining job where Tungsten Cobalt High Speed Steels were formerly used. Nowadays, however, they are rapidly being replaced by the Tungsten-Molybdenum-Cobalt type, such as Latrobe's CO-6, with excellent results.

You'll find that CO-6 equals, and in many cases exceeds, the performance of the 9% Cobalt Tungsten types. CO-6 is ideal for machining armor-plate, lathe beds, tank-rings, bearing races, car wheels, locomotive tires and other heavy-duty cutting applications where hardened or semi-hardened parts are involved. In ordering, unlike the Tungsten types, CO-6 need not be balanced with any other steel.

EASY TO HEAT-TREAT

Preheat at about 1450°F;
Harden at 2220° to 2260°F;
Quench in oil or air.
Double-draw at 1050°.

Heat-treating is simple. There is no danger of decarburization in hardening. CO-6 will prove tougher for many uses and provide cutting edges without any tendency to flake.

Our metallurgical staff will be glad to advise on the adaptability of CO-6, described in our new technical bulletin. Write for your copy.

TOOL STEELS FOR VICTORY

LATROBE

ELECTRIC STEEL COMPANY

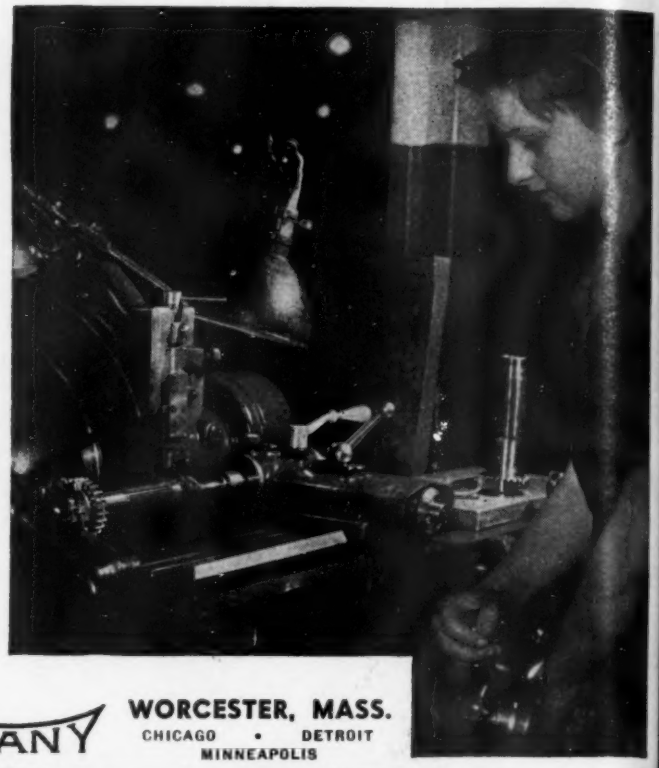
MAIN OFFICES *and* PLANT . . . LATROBE . PA.

Grinding Obstinate Steel Alloys

Super charger impeller shaft for Wright Cyclone Aircraft Engine is finish ground with the aid of ECONOMY GRINDING OIL (1654).

ECONOMY GRINDING OIL (1654) is a development to meet very severe grinding conditions incident to removal of stock from steels and alloys of peculiarly obstinate structure. Even where it has been necessary to greatly increase usually recommended feeds and speeds this oil is successful.

New catalog E-18 well worth having. Yours for the asking.



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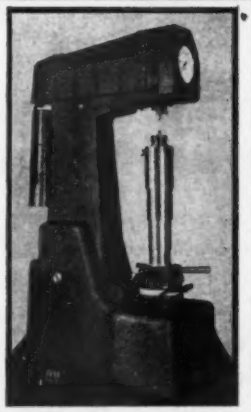

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Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

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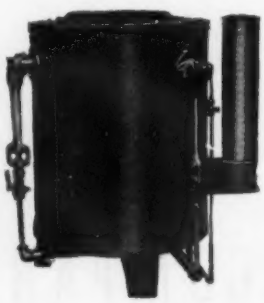

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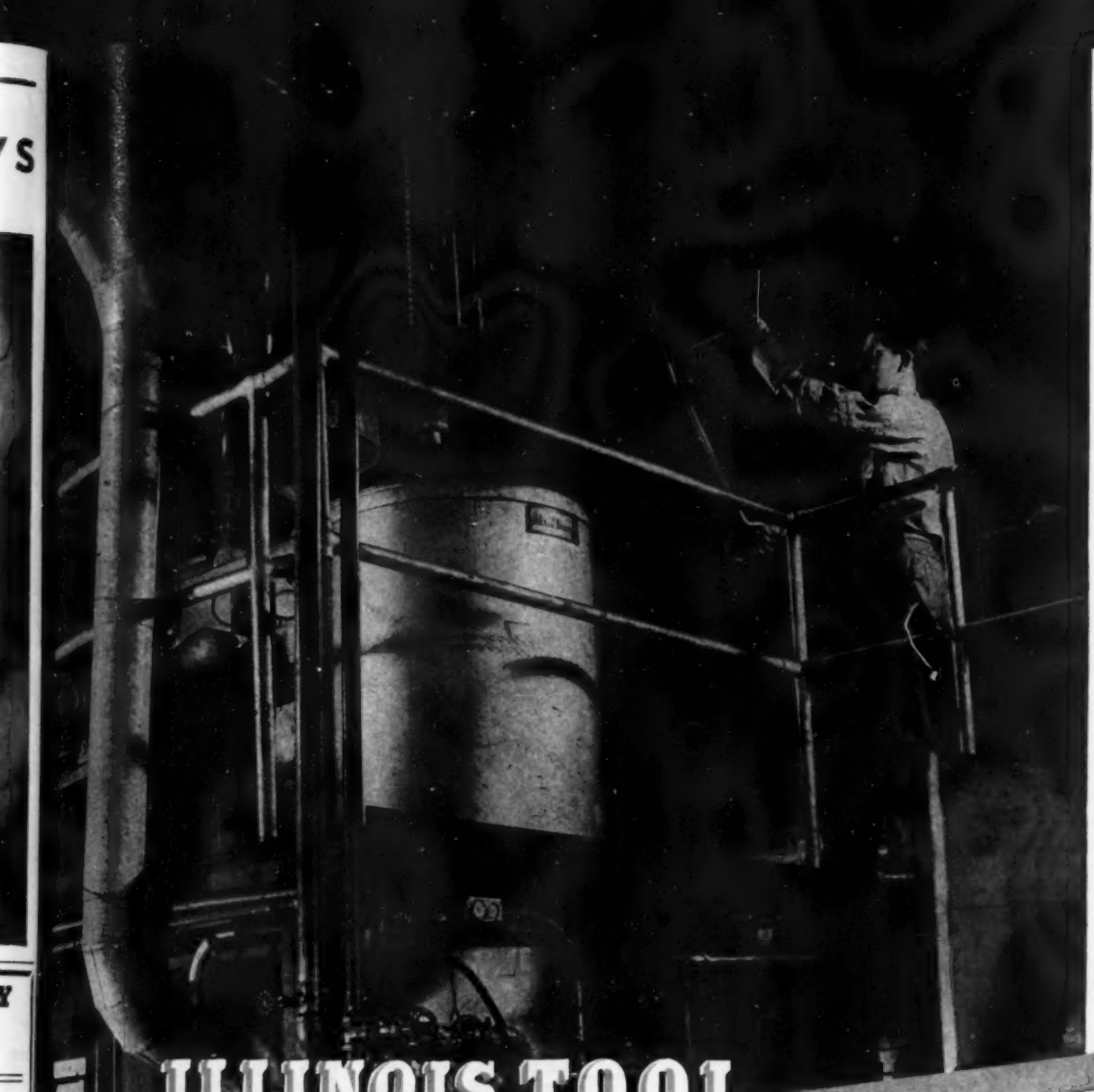

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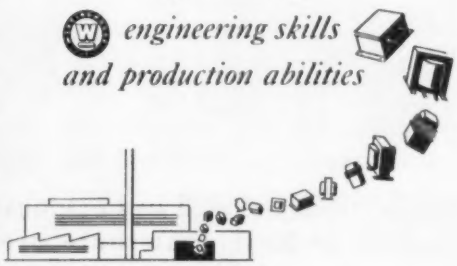

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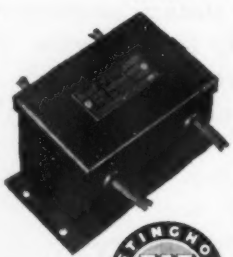

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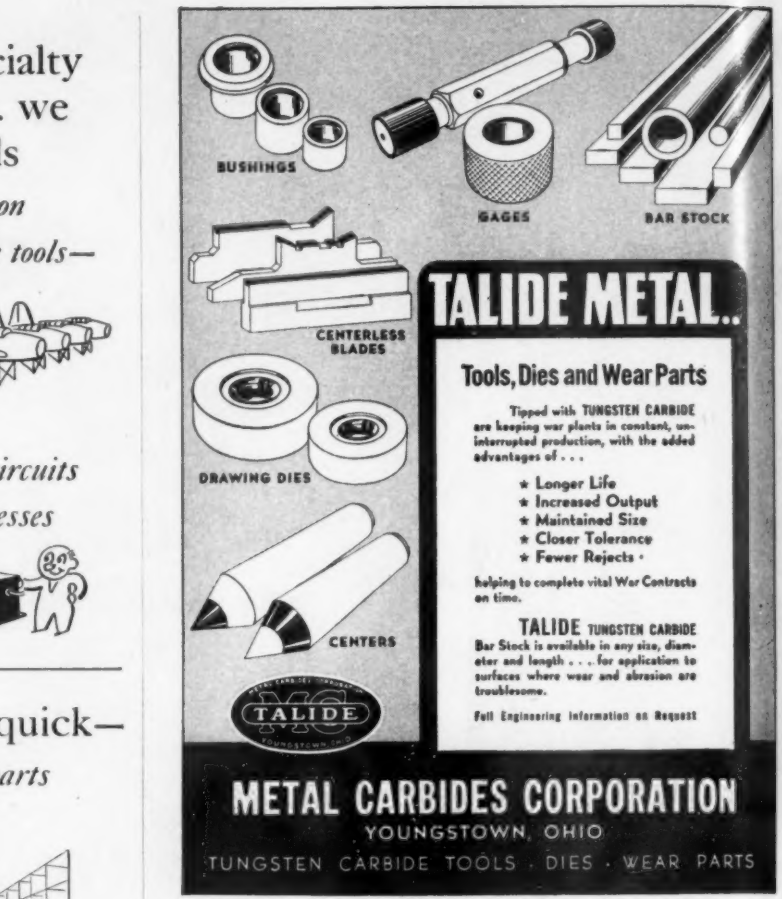
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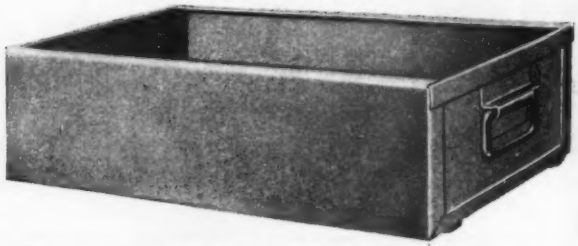

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HERE'S REAL CUTTING SPEED..

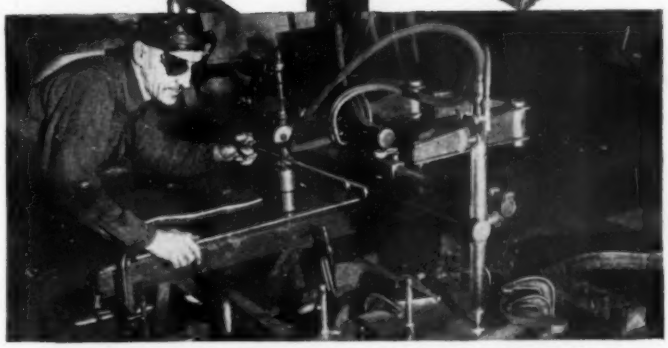
OVER 30" PER MINUTE WITH THE Airco "45" TIP

When manufacturers want really fast machine gas cutting, they use the Airco "45" High Speed machine cutting tip.

For example, De Bourgh Manufacturing Company, Minneapolis, Minn., designed a simplified one-piece laundry stand (shown at right) to be flame-cut out of 1/4" mild steel plate. Using an Airco "45" No. 0 tip, they cut the entire stand contour in one operation at a speed of over 30" per minute. 28 lineal feet of cutting with eight separate starts were required for each stand.

This performance is typical of the increased cutting speed provided by the Airco "45." Thanks to its divergent exit design and its use with higher gas pressures, the Airco "45" exceeds by 20% to 30% cutting speeds possible with standard design tips. For additional information, write your nearest Air Reduction office.

This one-piece laundry press stand is flame-cut quickly with the Airco "45"; then bent to shape and welded at the corners.



Stack cutting laundry press parts out of 10 gauge steel—ten pieces at a time. With the Airco "45" tip, cutting speed was 14" per minute.

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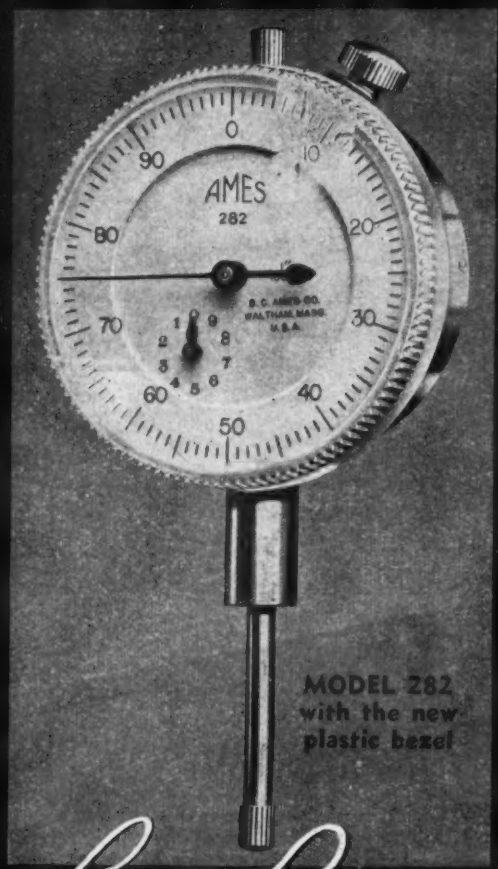

MODEL 282 with the new plastic bezel

Long Range
DIAL INDICATORS

For greater range when testing long tapers and in extensometer work, Ames Indicators having spindle travels up to one inch are commonly used.

The Plastic Bezel eliminates shadows and relieves eye strain. A new feature exclusive with AMES.

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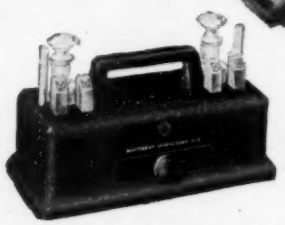

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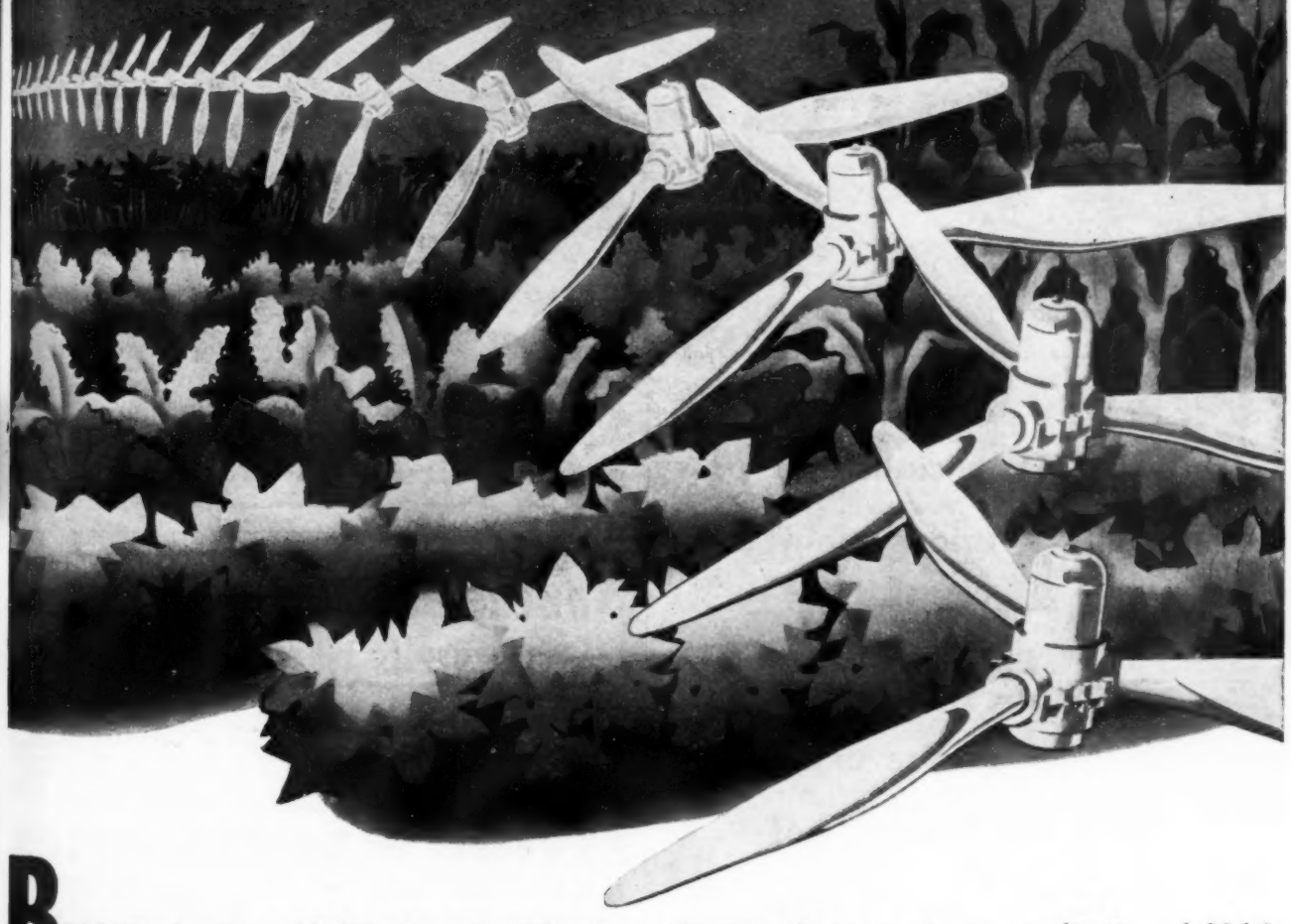

BLADES of grass — blades of an agricultural machine — blades of a propeller — to "make two grow" where only one grew before is now an essential service, and Boron may be a source of important help.

Boron, properly used, contributes to the useful properties of high-grade irons and steels, whether wrought or cast. Very small additions improve hardenability to a marked degree without impairment of machining quality.

FERRO-BORON of quite special character, which dissolves readily in cast iron or steel and from which the Boron recovery is very high, has been developed by the Molybdenum Corporation. Leading steel companies and foundries in widely varying production now use this ferro-boron, with uniform success, at minimum cost for material. Standard procedures are followed in obtaining results described.

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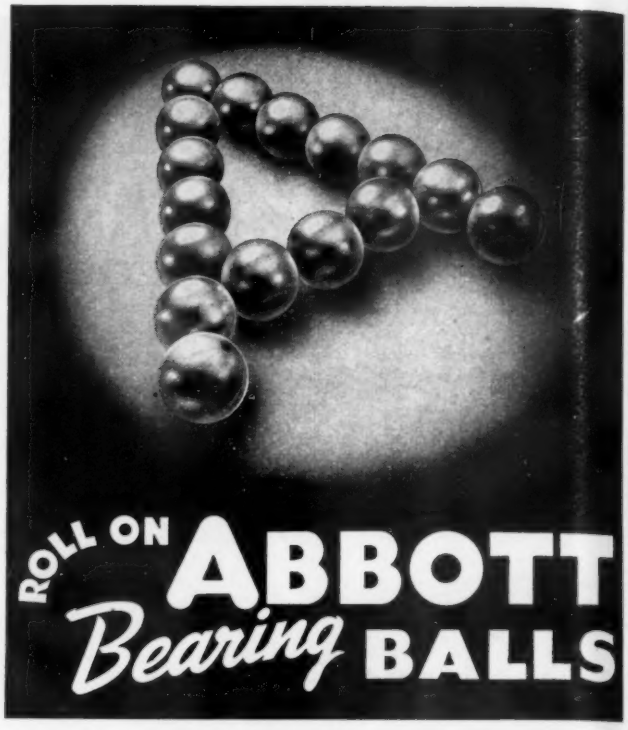

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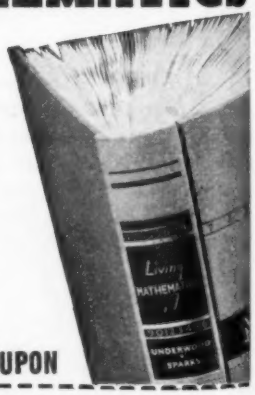

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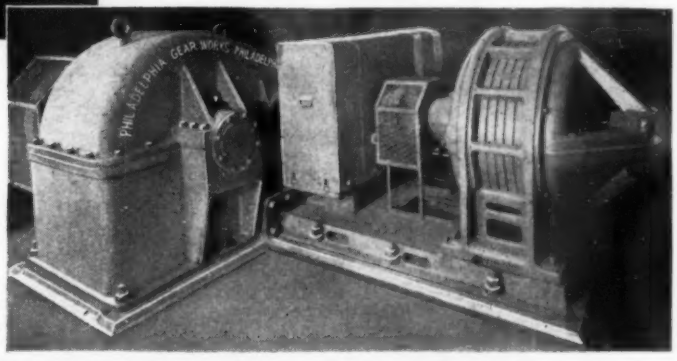
A Philadelphia Herringbone Reducer installed in a grain elevator



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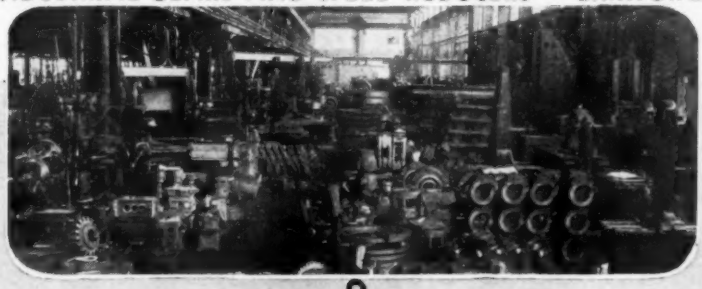

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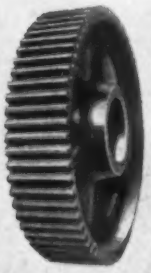

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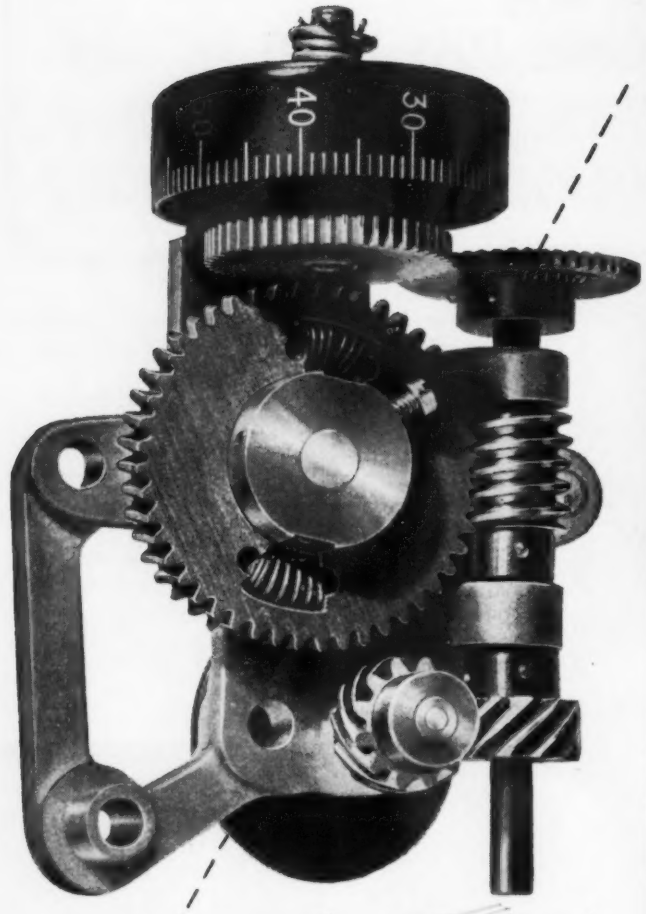

FLIGHT No. 4 REPORTING

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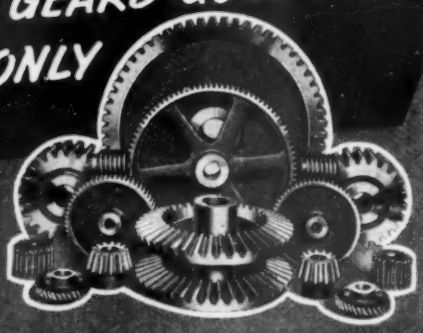

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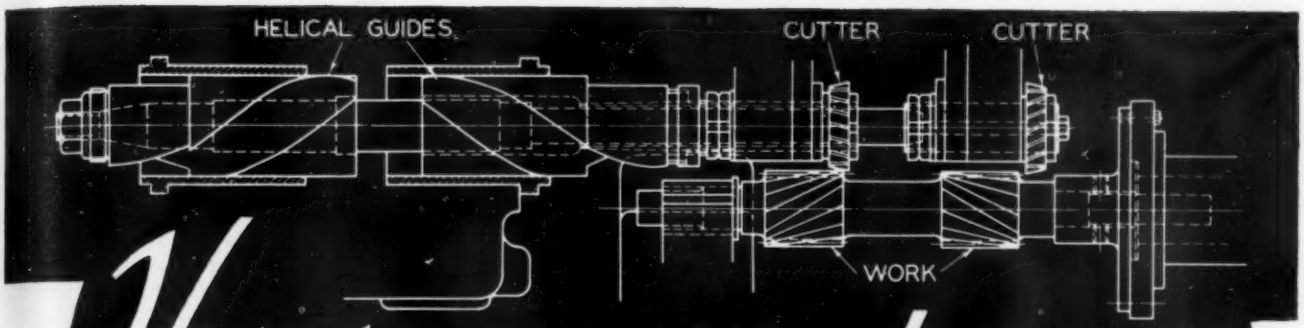
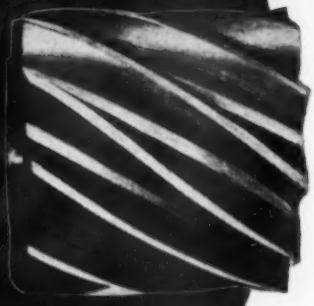
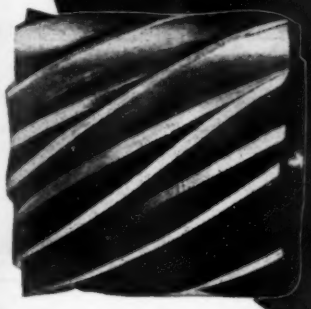


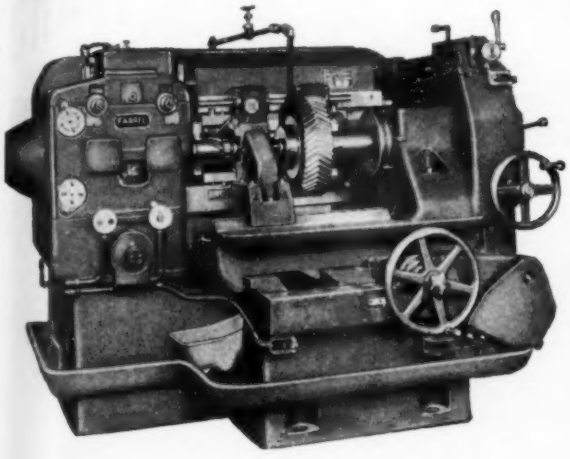
How you can cut TWO HELICAL GEARS at the Same Time





In the diagram above, two helical gears, spaced far apart and integral with a shaft, are being cut simultaneously on a Farrel-Sykes Gear Generator. Two cutters are mounted on the reciprocating carriage of the machine. One cuts when movement is in one direction, and the other when movement is in the opposite direction. There is no lost time here.

Farrel-Sykes Gear Generators are made in seven standard sizes, providing a range of capacities from 0 to 240″ diameter; 0 to 60″ face; 24 DP to 0.5 DP.



Farrel-Sykes Gear Generators will cut every type of gear for connecting parallel axes, including the well-known Sykes continuous tooth herringbone gear and any other type of double helical gear, single helical and straight tooth gears with both external and internal teeth, splined shafts and many other toothed forms and special contours.

Write for Bulletin No. 442 describing the advantages of this versatile machine in precision, speed, economy, and diversity of output.

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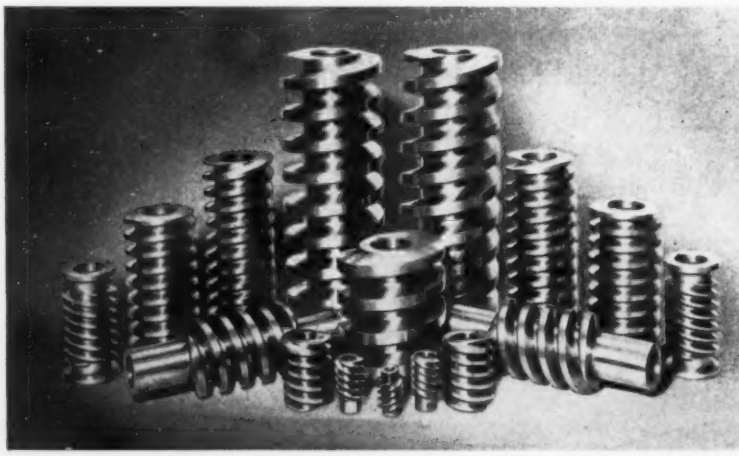
BRAUN GEAR CO., 1590-1608 Atlantic Ave., Brooklyn, N. Y.



ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS
Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa

SIER-BATH
OFFERS
PROMPT DELIVERY
OF
ACCURATE GEARS
FOR
WAR WORK

SIER-BATH PRECISION GEARS are produced in a completely-equipped modern plant on the latest type of gear-making machines. Work is carefully and constantly checked at every step by men having long specialized experience in gear production and who take pride in maintaining Sier-Bath high precision standards.

If you need gears—from 2" to 52" diameter—in any quantity and to any tolerances—SIER-BATH can meet your requirements promptly on proper priority.

The Doorway to 38 years experience in making Precision Gears

SIER-BATH GEAR CO.
NORTH BERGEN . NEW JERSEY
Incorporated

BEVEL GEAR RATIO

can be changed by merely changing the pinion.

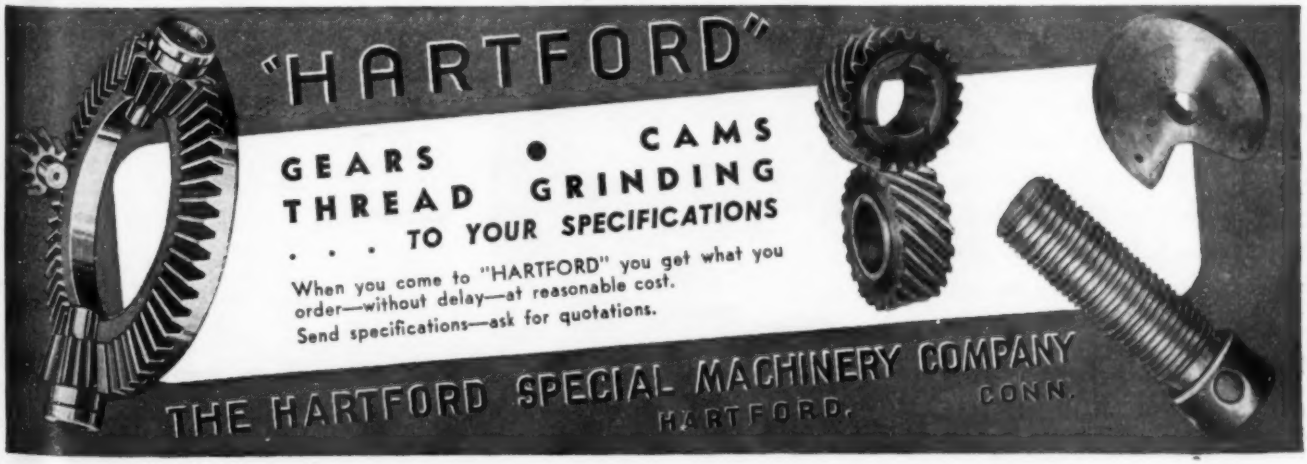
BILGRAM

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

GEAR CUTTING MACHINES

New Design
New Features
New Advantages

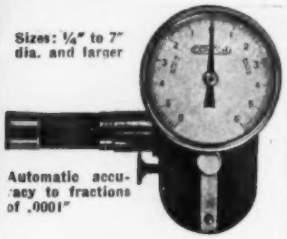
NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK, NEW JERSEY


"HARTFORD"
GEARS • CAMS
THREAD GRINDING
. . . TO YOUR SPECIFICATIONS
When you come to "HARTFORD" you get what you order—without delay—at reasonable cost.
Send specifications—ask for quotations.
THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD, CONN.

"This war has certainly taught us a lot about GAGING!"

For precision bores the modern gaging method is to use

COMTORPLUG



The need to obtain more precise tolerances with less experienced help has led to a wide demand for Comtorplug. Its automatic accuracy—even in the hands of trainees—permits much more precise gaging than limit gages. Furthermore, Comtorplug reveals such inaccuracies as out-of-round, bell mouth, front or back taper, barrel shape, etc., showing the exact dimension of any part of a hole to fractions of .0001"—not a passing reading. Used for bench or laboratory inspection, as well as gaging at the machine.

Request Bulletin 29

THE COMTOR CO.
68 Rumford Ave.
Waltham, Mass.

THE JOHNSON FRICTION CLUTCH

DOUBLE TYPE

IMPROVE POWER TRANSMISSION
with the **NEW "MAXITORQ"**
(MULTIPLE DISC) CLUTCH

This new JOHNSON design—the result of more than 40 years' specialization in the development of friction clutches—is particularly adapted to machine tool application because of its compactness, simple adjustment and easily controlled engagement. It can be assembled or disassembled without the use of tools. Floating discs minimize drag, abrasion or heating in neutral.

"MAXITORQ" FLOATING DISC CLUTCHES are available in dry (self lubricated) and wet (running in oil) types in single, double and cut-off coupling types. Capacities range from ½ HP to 5 HP at 100 r.p.m. Send for detailed dimension sheets.

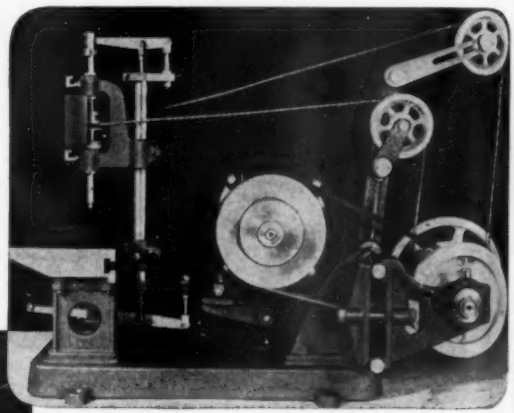
WRITE FOR MULTI DISC CLUTCH CATALOG NO. 74 OR CONSULT SWEET'S OR THOMAS' REG.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

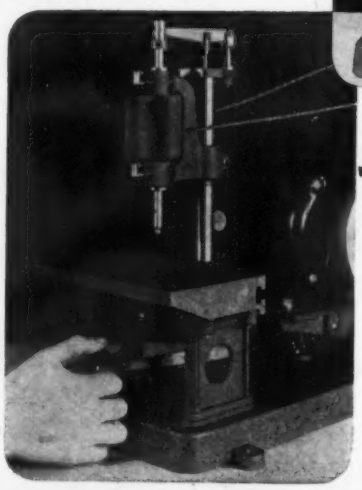
FOR PERFECT HOLES FROM .004 to 1/16"

use a Super Sensitive

L & D HIGH SPEED DRILL PRESS



Speeds from 3000 to 23,000 R.P.M. Available with one, two, three or four spindles.



Super Sensitive is the word for it. Finger tip control, plus precision, balanced construction give perfect holes with maximum production, and a minimum of drill breakage . . . If you build instruments and other tools and parts requiring very small holes—if you demand the ultimate in precision tooling—if you require high production even from green help—mail the coupon today for complete details on the L & D High Speed Drill Press.

Please send me complete details on the Super Sensitive Drill Press.

Name ..... Title .....

Company .....

Street .....

City ..... State .....

A.M.

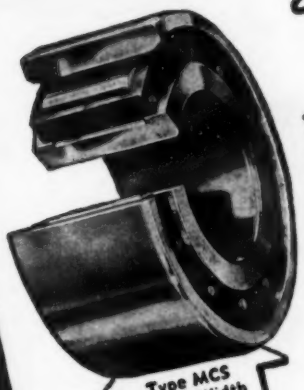
EDWARD BLAKE COMPANY
674 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

ROLLWAY'S

Right-Angle

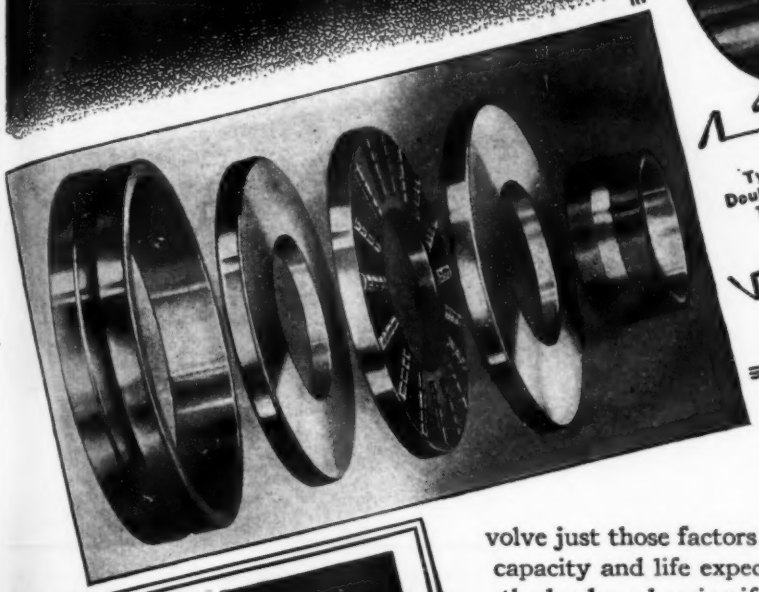
BEARING LOADING *is the* RIGHT LOADING!



Especially

FOR

1. higher bearing capacity in the same dimensional limits
2. oscillating or shock loads
3. heavy thrust loads
4. continuous operation without cool-off
5. longer bearing life under all loads



For longer bearing life, more efficient performance and more economical maintenance . . .

FOLLOW THIS BASIC BEARING PRINCIPLE

- All radial loads carried at right angles to the roller axis.
- All thrust loads carried at right angles to the roller axis.

● The advantages of Rollway's right-angle bearing loading are so self-evident as to be axiomatic. They involve just those factors that are used in computing the carrying capacity and life expectancy of *every* bearing. In short, reduce the load per bearing if you want to lengthen the life, counteract shock and vibration, or provide freer running.

Rollway Splits Each Load Into Two Parts

Rollway *reduces the load carried per bearing* by the simple expedient of splitting each load into its two simplest components of pure radial and pure thrust. Each of these two components is carried by a separate bearing assembly, and always at right-angles to the roller axis. There are no compound loads, no oblique resultants, to complicate design and pile up stresses. And there is no wedging or pinching of rollers, therefore, markedly less rubbing friction and wear-back of the roller heads.

Standard Sizes for Most Applications

● S.A.E. or American Standard metric dimensions and tolerances in a wide range of sizes and types assure low cost and ready availability for most applications. Let our engineers recommend the types best suited to your needs. Send sketch, drawing, or detailed description for free confidential bearing analysis and recommendation. No obligation.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

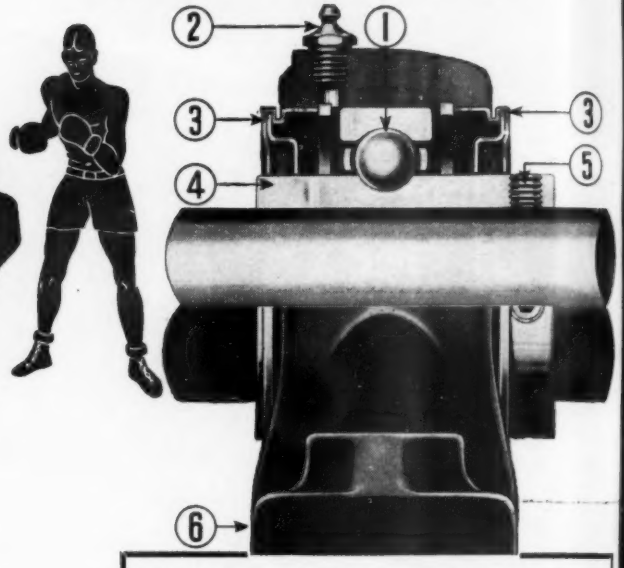
BUILDING HEAVY-DUTY BEARINGS SINCE 1908 **BEARINGS**

THE FLYWEIGHT BEARING CHAMP

FROM THE *Friction Fighter* CAMP

LINK-BELT

SERIES 100 BALL BEARING



Link-Belt Ball Bearings share the excellence of engineering design and precision manufacture that equip their heavier-duty brothers in the roller bearing group, for their victory over friction. They parry thrust from either direction, and stand up valiantly under combination of thrust and radial loads. Series 100 Ball Bearing units come garbed for duty in pillow blocks, flanged units, take-up units, or unmounted. They're champions in their class, just as Link-Belt roller bearings are in their respective classes which range up to heavyweight. Send for Engineering Data Book 1775-A. Link-Belt Company—Indianapolis 6, Chicago 9, Philadelphia 40, Dallas 1, San Francisco 24, Atlanta, Toronto 8. Branch offices, warehouses, distributors in all principal cities.

1 Single Row Self-Aligning Ball Bearing of the deep groove type allows total misalignment of $^{3}/_{16}$" within a radius of 12", or $^{15}/_{16}$" within a radius of 5 feet.

2 Grease fitting conveniently located at 45 degrees from horizontal centerline of bearing.

3 Labyrinth type cover seals keep grease in and foreign matter out. Since both seals operate on the extended inner race, bearing is fully protected from the time it leaves the factory. This sealing feature prevents wearing of the shaft from sealing and permits assembly on shaft without liability of damaging seals.

4 Extended Inner Race allows distribution of bearing load over large shaft area.

5 Two self-locking setscrews securely lock bearing to shaft.

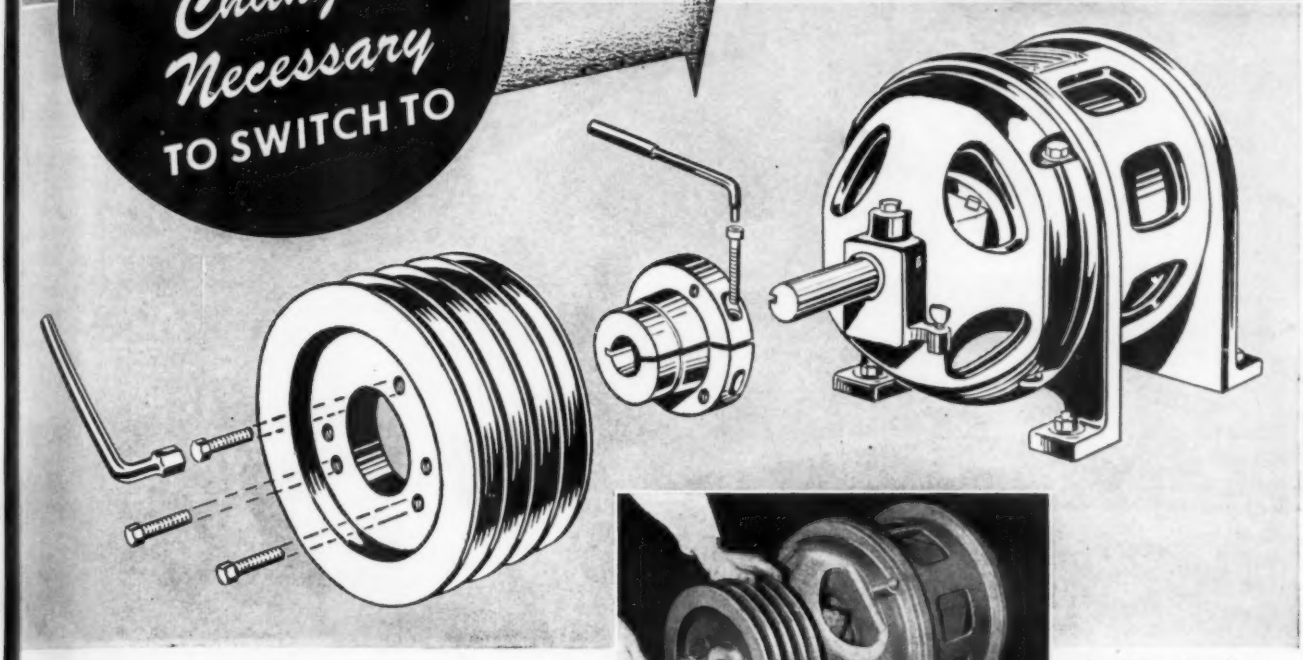
6 Sturdy, compact, streamlined housing requires minimum support space. Provided with slotted holes for foundation bolts.

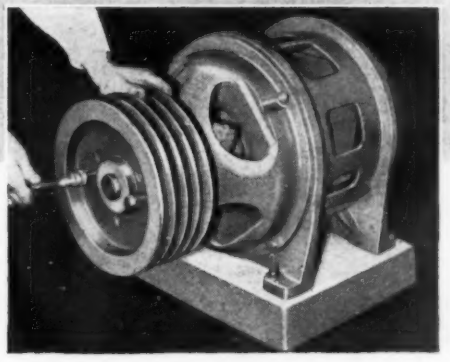
LINK-BELT

FRICTION FIGHTER BEARINGS

Roller and Ball Types

No Engineering Changes Necessary TO SWITCH TO PYOTT QUICK DETACHABLE QD SHEAVES





Pyott QD Sheaves licensed under U. S. Patent No. 2298821

Simple as A-B-C

A Slip split hub on shaft in line with keyway. Tighten clamping cap screws which anchor hub immovably to shaft.

B Slip sheave on tapered hub in line with bolt holes. Insert pull-up bolts and tighten; this provides an assembly as positive as press fit.

C To remove, unscrew pull-up bolts and insert two of the bolts in tapped holes in rim of sheave. Turn down and the bolts pressing against hub act as jack screws, loosening the sheave until it can be slipped off.

***New catalog** shows complete details and lists all standard QD sizes. Write for your copy.*

Machine manufacturers employing Multiple V-Belt Drives can reduce factory assembly time and add sales appeal to their product with Pyott QD Sheaves. By using standardized QD sizes the cost is no more than for regular standard sheaves.

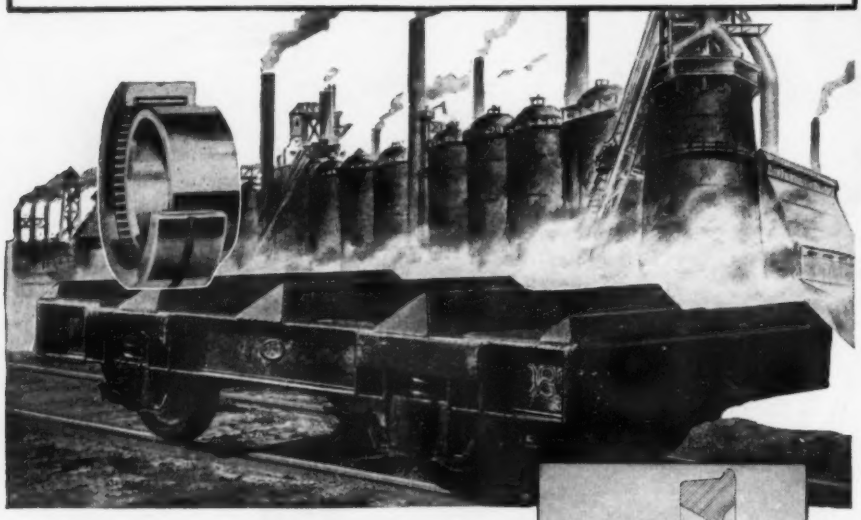
A drive can be lined up in a few minutes because of the separate hub and rim design. Mounting or dismounting of the sheave is actually as easy as replacing an automobile tire. If factory run-in tests are necessary hubs need not be removed for shipment, thus providing customers with a prealigned factory drive.

The hub construction assures a positive press fit on the shaft. Seasonable changes can be quickly made without use of variable speed motors. Furthermore, bearings cannot be damaged in removal of sheaves because the jack screw action of the pull-up bolts inserted in the tapped holes in the rim apply pressure on the hubs and not the bearings. It will pay to switch to Pyott QD Sheaves.

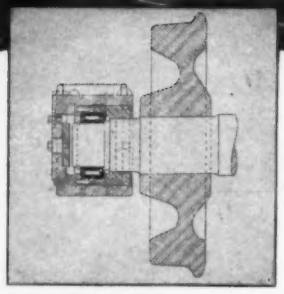
PYOTT FOUNDRY & MACHINE CO.
328 NORTH SANGAMON STREET • CHICAGO, ILLINOIS

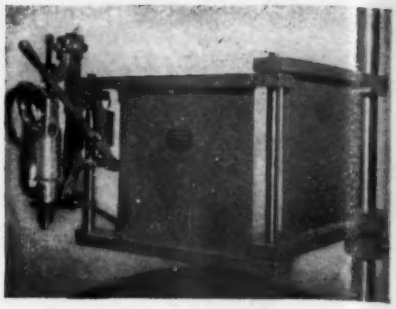
SPROCKETS, GEARS, PULLEYS, SHEAVES, CAST IRON AND SEMI-STEEL FOUNDRY WORK

IN THE NEWS
WITH TORRINGTON—BANTAM

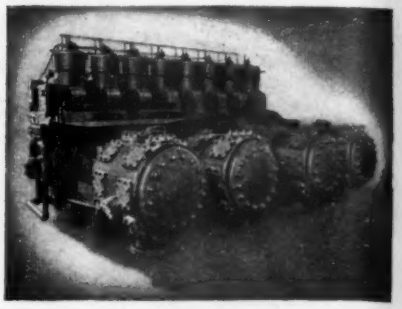


25 TONS OF CHARGE are carried by buggies like this one, to feed the steel furnaces at the Kaiser plant on the West Coast. Constructed by the American Car and Foundry Company, these cars employ Needle Bearings Type NCS on the axles, as shown in drawing. Efficient service is contributed by the low friction coefficient, high load capacity and effective lubrication method of these bearings.





DRILL PRESS OPERATION was obtained in this Black & Decker portable drill through the development of a radial arm attachment to speed production in an airplane factory. Compact arm design and flexibility over a wide radius of operation are combined with anti-friction performance through the use of NCS Needle Bearings—a typical case where the small size and high load capacity of these bearings have proven important advantages.



NO TIME FOR SHUTDOWNS in the oil industry—and these sturdy two-cycle, gas-engine-driven compressors built by Clark Bros. Co. Inc., are designed for service 24 hours a day. Type NCS Bearings are used in the wrist pins of the scavenging pump crossheads where the high load capacity of these bearings assures smooth, reliable performance. A catalog containing complete data on our line of Needle Bearings will be gladly sent upon request. Just write for Bulletin D-104.

NEEDLE BEARINGS FOR ALL PURPOSES, as well as special and standard anti-friction bearings of every type, are available from one source through the combined facilities of Bantam and Torrington. Here, too, is experienced skill to serve you in the unbiased selection or design of bearings to meet any requirement. For the utmost satisfaction in the solution of *your* bearing problems, TURN TO BANTAM.

FARM PLANTING is made easier by this heavy-duty "Rototiller" which prepares seed beds all ready for planting in a single operation. Needle Rollers Type LN are assembled into economical, high-capacity anti-friction bearings on both ends of the connecting rods and on the wheels of this progressively designed unit. The rollers at the wrist pin end are projected beyond the connecting rod in such a way that they are constantly lubricated by a fog of oil from the crankcase. At the lower end, oil catches are used.

ARMY (E) NAVY

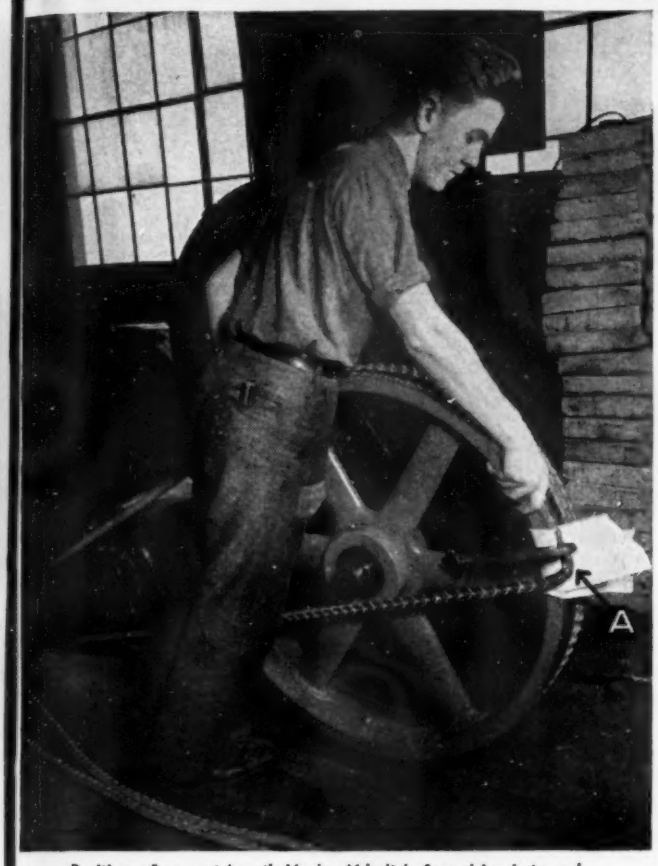
TORRINGTON BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

THE TORRINGTON COMPANY · BANTAM BEARINGS DIVISION

SOUTH BEND, INDIANA

He's Getting Ready to Speed PRODUCTION



Position of correct length Veelos V-belt before drive is turned.

DO what he's doing... install Veelos... the proved and practical V-belt... and you'll gain the advantages of a *peak* production drive. Construction of the Veelos link provides quick, easy tension adjustment to end slippage... keeps machinery running at full speed and productivity. Install Veelos and make the most of your machines and manpower.

FREE! COMPLETE, NEW VEELOS PRODUCTION MANUAL!

This free manual—"Drive Production Higher with Veelos V-Belt"—gives complete instructions on use, length table, engineering data, detailed description of Veelos link construction. Shows how to measure, couple, uncouple any size of Veelos. Write today for your copy of this valuable reference.

IMPORTANT INSTALLATION DIRECTIONS

Sizes 3/8", A, B and C Veelos V-belts must be 1" per foot short of pitch length.

Sizes D and E Veelos V-belts must be 3/4" per foot short of pitch length.

Measure one belt on floor or bench from end rivet to first empty hole. Make up all other strands with the same number of segments.

1. After correct length has been determined, place belt in nearest groove of small sheave.

2. Place belt in nearest groove of large sheave as far as it will go to point A in illustration.

3. With SMALL sizes *hold belt with hand* at point A and turn drive until belt is in groove all around. With LARGE sizes *hold belt with "C" clamp or rope; put cloth pad* between belt and sheave rim.

4. Turn drive until belt is in groove all around. (Caution: *Always turn drive manually.* If necessary, a bar can be used for leverage.)

5. Work belt across to inside grooves by turning drive. Repeat until grooves are filled.

Veelos is made in all standard sizes (3/8", A, B, C, D, E) ... fits all standard V-belt grooves

VEELOS
THE LINK
V-BELT
ADJUSTABLE TO ANY LENGTH
ADAPTABLE TO ANY DRIVE

MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

THE LAST WORD IN CAP SCREWS

Wherever socket cap screws are needed . . . for Production, Assembly or Maintenance, use Knurled "Unbrakos." They are preferred by mechanics because knurling positively prevents time wasting finger-slip so each turn counts.

Combined in "Unbrako" Socket Cap Screws are all the desired features —Strength and Accuracy plus knurled heads.

Get the "Unbrako" Catalog

Reg. U. S. Pat. Off.

Where ordinary set screws might fail to hold apply "Unbrako" Self-Locking Hollow Set Screws. Tightened as usual, the knurled points dig in and keep screws tight; yet they can be easily removed and used again and again.

Pat'd. and Patts. Pending

SIZES
No. 4 to 1½ diameter

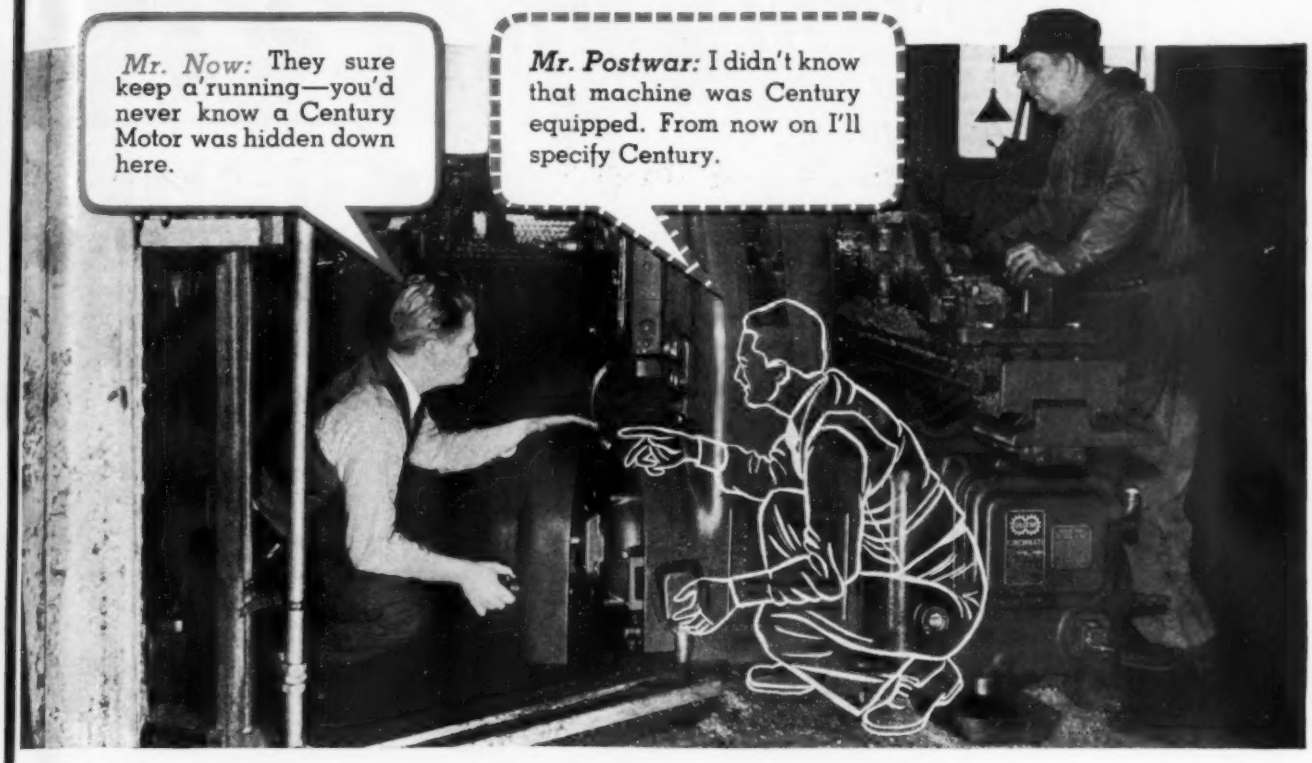
40 Years in Business

Knurling of Socket Screws originated with "Unbrako" years ago

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 BRANCHES: BOSTON · DETROIT · INDIANAPOLIS · CHICAGO · ST. LOUIS · SAN FRANCISCO

Take a Look at TOMORROW—*Today!*


Mr. Now: They sure keep a'running—you'd never know a Century Motor was hidden down here.
Mr. Postwar: I didn't know that machine was Century equipped. From now on I'll specify Century.

QUIET AND OFTEN UNSEEN
BUT ALWAYS VITAL!

Century Form J Motor

Not only on machine tools, but on many widely varied applications, the electric motor may be hidden from sight. Yet, because the machine performance depends to such a large extent upon the motor and its characteristics, it is one of the most vital parts.

In thousands of applications, particularly on machine tools, Century Motors are the unseen, dependable servants of the machine operators. They'll run quietly, continuously, and with an unusual freedom from vibration that contributes much to precision workmanship.

Today, under the rigid demands of Wartime production, Century is developing even finer motors than we have made in over forty years of manufacturing—motors that correctly match the demands of the machine and which are properly protected against surrounding conditions as well.

Remember the importance of the motor, even though unseen — and it will pay you to think of Century in *your* postwar planning.

CENTURY ELECTRIC CO., 1806 Pine St., St. Louis, Mo.
Offices and Stock Points in Principal Cities

324

1/6 to 600 horsepower.

One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World

ANNOUNCING

A NEW SERIES of Style SAML

H&G

SOLID ADJUSTABLE DIE HEADS

with Insert Chasers

for **BROWN & SHARPE** *Automatics*

Made in five sizes for B & S automatic screw machines, numbers 00, 0 and 2. A new alignment feature takes care of variation in alignment between turret and spindle. The holder is now made an integral part of the head. These Heads use the famous low cost H & G High Speed Insert Chasers. Good deliveries on high priorities.

Write for Bulletin

● *Contains detailed information and specifications you will need.*

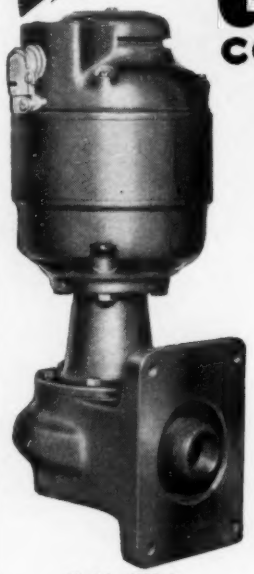
The Eastern Machine Screw Corp.

MANUFACTURERS OF H & G DIE HEADS SINCE 1914

20 - 40 Barclay Street — New Haven, Conn.

For **HIGH-SPEED** *Production*

GUSHER COOLANT PUMPS



Model 11020-A

Full ball bearing design minimizes friction . . . no pump priming . . . not injured by small chips and grit . . . split-second control, these and other features of Gusher Coolant Pumps help you meet your high speed production schedules.

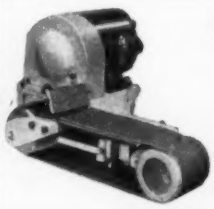
There's a "Gusher" to meet your needs. Types and sizes from 1/10 to 2 h.p.

Write for data and specifications

THE RUTHMAN MACHINERY CO.

1809 READING ROAD — CINCINNATI, OHIO

LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS



STANDARD D-4 ABRASIVE BAND GRINDER

This new bench type grinder assures fast quality finishing on metals, plastics, wood, fibre . . . at low cost. Equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. Ideal portable unit.

Informative Booklet on Finishing Free

WALLS SALES CORP., 96 Warren St., N. Y. C.

NEED SUB-CONTRACTS?

Investigate the possibilities offered you through advertising in the CONTRACT WORK SECTION!

For details, write

CONTRACT WORK DEPT.

American Machinist — 330 W. 42nd St., N. Y. C.

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All Die Makers' Supplies
Danly Commercial Sets
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SOCKET-HEAD CAP SCREWS
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DANLY MACHINE SPECIALTIES, INC.
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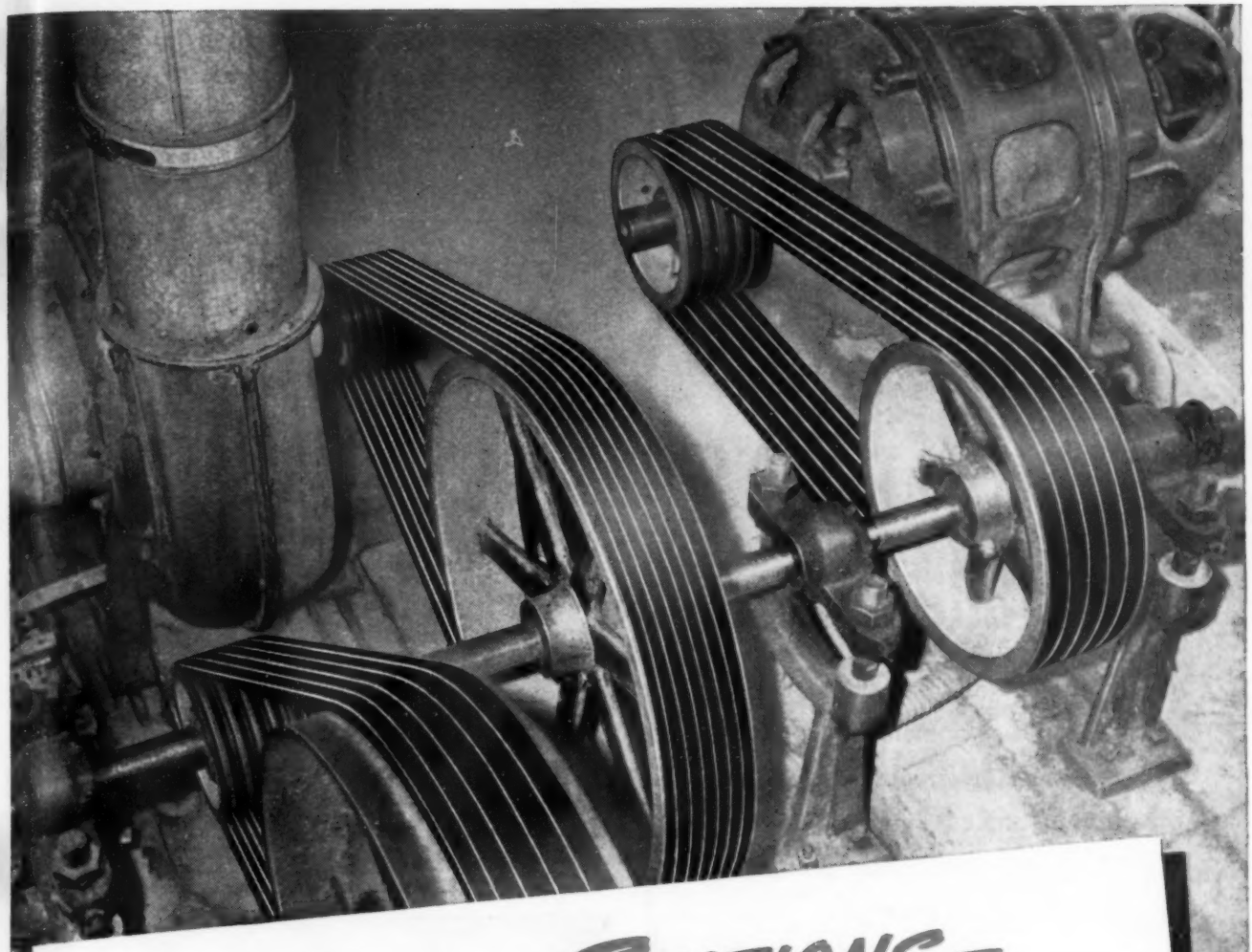
DUCOMMUN METALS & SUPPLY CO.
Los Angeles • San Francisco

DANLY PRECISION DIE SETS



BATTLE STATIONS—

Machines driven by Dayton V-Belts man the battle stations of the production line. And in over 100,000 war-vital plants tough, durable Daytons stand up under high speeds, peak loads and shock loads despite staggering work schedules, excessive temperature, dust and moisture conditions. Built-to-bend Daytons grip firmly and transmit smooth-flowing power for every kind of job from sun-up to sun-up around the calendar. For American industry at war Daytons are increasing output, cutting power losses, reducing maintenance, protecting machinery and conserving time, money and floor space.

Near you is a Dayton distributor whose stock of V-Belts is supplemented by strategically located factory warehouses. Call on him for service or helpful suggestions regarding the conservation of V-Belts.

THE DAYTON RUBBER MFG. COMPANY
The World's Largest Manufacturer of V-Belts
DAYTON OHIO

DAYTON RUBBER EXPORT CORPORATION
38 Pearl Street New York, N. Y. U. S. A.

Dayton V Belts
LIFELINES OF POWER VITAL TO VICTORY

Remember

RITCO

for

SPECIAL BOLTS NUTS and STUDS

Don't forget—we are well qualified in experience and equipment to supply special bolts, nuts and studs to your specifications . . . and can supply them NOW in limited quantities for war production. Let us know your requirements.

Remember **RITCO** *for*

SPECIAL BOLTS, NUTS & STUDS
DROP FORGING & DIE SINKING
SCREW MACHINE PRODUCTS
HEAT TREATING
SPRAYED METAL SERVICE
PARKERIZING

Estimates gladly submitted. Send samples or blueprints. Catalog on Request.

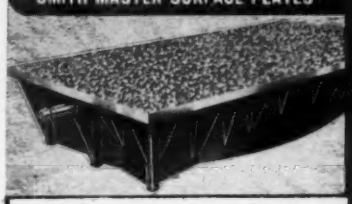
RHODE ISLAND TOOL COMPANY

148 West River St., Providence, Rhode Island

Serving American Industry Since 1834

RITCO

SMITH MASTER SURFACE PLATES



On specifications requiring a total flatness tolerance of one ten-thousandths of an inch, medium size Smith Master Surface Plates have successfully met the test to the entire satisfaction of hard-to-please users.

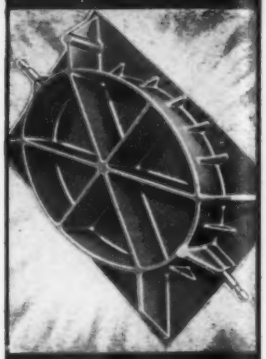
Precisely... **RIGHT**

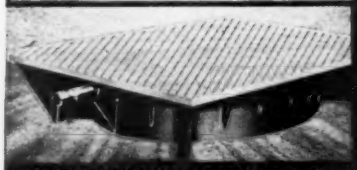
Present day inspection and assembly demands surface plates of utmost precision accuracy. Plants engaged in aircraft and ordnance production throughout the country have come to depend on Smith Plates. Their complete satisfaction is evidenced by frequent reorders. If your requirements call for precision accuracy, wire, phone or write.

SMITH TOOL & ENGINEERING CO.
851 North Sandusky St., Bucyrus, Ohio

Available Sizes

8" x 12"	18" x 18"	20" x 30"	30" x 60"	
9" x 14"	18" x 24"	24" x 36"	36" x 68"	
12" x 18"	24" x 24"	30" x 36"	48" x 96"	

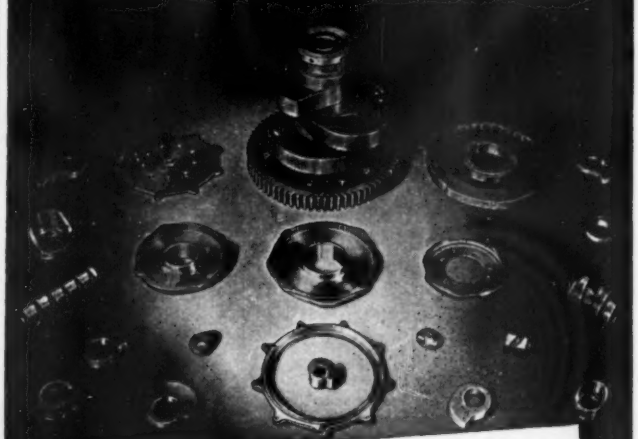




SMITH PRECISION LAPPING PLATES

The same close tolerance accuracy for developing a true plane when lapping metal to metal joints, characterizes Smith Precision Lapping Plates in the same manner as will be found in Smith Master Surface Plates.

CAMS



LET the largest, most completely equipped cam milling plant in the mid-west handle your cam problems. All sizes of drum, face, groove or other styles of cams cut to order in quantities of one or one thousand. Send specifications or blueprints for a quotation on your requirements.

KUX MACHINE COMPANY
3930-44 W. HARRISON, ST. CHICAGO, ILL.

HATS OFF TO AMERICAN WOMEN!

THEY, TOO, ARE DOING JOBS NEVER THOUGHT POSSIBLE!

★ In this war, as in World War 1, American women are answering Uncle Sam's call to fill the ranks in Industry as more and more men are enlisted in our armed forces. With alert minds and nimble fingers, thousands of American women are performing their tasks on machines and assembly lines with a fine sense of loyalty and patriotism. And they are doing their work well . . . work that in many cases calls for unusual mechanical ability.

For example . . . here are women operating a battery of Greenlee 6-Spindle Automatics in the Detroit plant of the Ex-Cell-O Corporation. They are operating these accurate, high-production machines entirely satisfactorily. Yes . . . women, too, are doing jobs never thought possible.

And What About the Job of Training New Operators?

When it comes to Screw Machines, training new operators is never a quick or easy task, but there are many advantages offered today in machine designs that shorten the training period . . . make possible the use of women operators. For instance, here are a few of the mechanical improvements found in Greenlee Automatics that greatly aid and simplify the task.

1 ***The wide-open tooling area on the Greenlee*** provides easy access to working tools with more elbow room for changing set-ups. Low, convenient height of machine affords a clearer view, at floor level, of the various working parts, and reduces physical strain on operators.

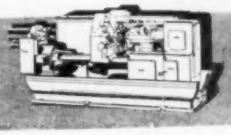
2 ***No camming is required on main tool slide,*** and adjustments are simple. Exact settings for tool slide stroke are quickly made by means of an adjustable dog located on a graduated worm wheel. A scale on each side of tool slide is provided to keep check on stroke while machine is in operation.

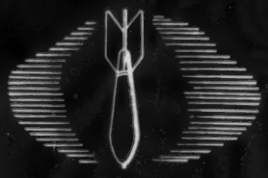
3 ***Cross Slides are independently operated with*** separate cams . . . permits better tooling set-ups . . . increases production. Cams are interchangeable and eliminate special camming for each job. They are quickly and easily changed and save set-up time.

4 ***A wide range of speeds and feeds*** for production and economy are provided, any of which are easily obtained by changing multi-splined pick-off gears. On machine with chucking capacity for 1⅜" O. D. stock, spindle speeds range from 105 to 2625 R. P. M. with a feed range for .0017 to .0388.

Greenlee Engineers stand ready and willing to assist you with any of your Screw Machine Problems. *Engineering surveys will be gladly rendered without obligation.*

★ ★ ★ **GREENLEE BROS. AND CO.** ★ ★ ★
1735 MASON AVE. • ROCKFORD, ILLINOIS

GREENLEE  *Automatic Screw Machines*



Who Wins Wars?

Strangely enough, the average man does! Much as we all detest war the fact is that under its stimulation a nation always develops new products with infinite peacetime applications. To date, scores of fantastic devices have been created for war purposes which one day will contribute mightily to the American Way of Life. Weatherhead is producing at the rate of *millions every day* many products that have peacetime application. Just as we've helped build cars, planes and refrigerators in the past, Weatherhead is well prepared to help you build the many new products of the future.

Look Ahead with

Weatherhead

THE WEATHERHEAD CO., CLEVELAND, OHIO
Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles
Canada—St. Thomas, Ontario

Increased Production

means more jobs for

MACHINISTS

—and MORE PAY for men who know their work

This big home-study and reference course gives you the practical facts on machines and methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency with

AMERICAN MACHINISTS' LIBRARY

6 volumes, 2516 pages, 2368 illustrations, many charts and tables

THESE books answer your questions on methods and machines—tell what you need to know about the operation of machines of all types and sizes for the whole range of metal cutting, forming, and finishing operations —show by text, diagram, and illustration the essential points of setting up work, adjusting machines, selecting feeds and speeds, determining pressures, handling materials, devising short-cuts, etc.

Puts the mastery of machine-shop work at your fingertips

With these books at hand for quick reference, no job is too hard or unusual, and the routine jobs may be improved, with savings in time and trouble and reduced wastage.

What the Library gives you

—complete guide for everybody, from shop executive to apprentices, interested in the operation of machines used in turning and boring practice
—description of all important varieties of machines, both manual and automatic, and methods of operating them
—data on speeds and feeds, new cutting alloys and materials, use of coolants, etc.
—practical information on grinding machines and abrasive wheels, showing what they do, how to operate them, and how to make best use of them on various types of work.
—training in the various operations performed in drilling and surfacing materials in the machine shop
—exact, descriptive data on all aspects of gear-cutting practice useful in shops of any size
—essentials of selecting machines, setting up work, and handling operations in reaming, tapping, planing, shaping, slotting, milling, and broaching

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Send me the American Machinists' Library, 6 volumes, charges prepaid, for 10 days' Examination. If I find the books satisfactory, I will send you $1.50 in 10 days, and $3.00 a month until the special price of $19.50 has been paid. Otherwise I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

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AN IRON HAND . . . *in a Velvet Glove*

12 millionths of an inch is tolerance limit for work on this Ultra-Lap Machine that produces optically flat metal surfaces. A compactly designed Morse Roller Chain drives the front spindle—delivering a power flow that remains necessarily constant and "precise"—because there's no possibility of slip, regardless of load.

THE LINKS—"metal fingers"—of Morse Chain Drives are tough and sure, slip-proof. That's why Morse Chain Drives are selected for jobs where power must be transmitted with an "iron hand"—firm, steady and dependable—capable of handling even steel mill roll drives of 5,000 h.p. and upward, at high speeds, at practically 100% efficiency—without power losses due to slippage that might occur with other type drives.

BY CONTRAST . . .

Morse Chain Drives, because they operate on the principle of "Teeth Not Tension" and perform like an "iron hand in a velvet glove", are selected for precision work requiring amazingly close tolerances—because they deliver a flow of power that is constant and uniform, assuring a uniformity of produced parts that cannot be approached where driving devices slip or falter even slightly.

* * *

If you are engaged in post-war planning, looking ahead—then look to Morse for equipment that will help your machines to better, speedier production, and lowered production costs. Right now, your nearby Morse representative will be glad to help you solve any power transmission problems relative to essential war-time production.

A mass producer of tank parts, this 100" Betts boring mill employs Morse Chain Drives to transmit power for feeding and rapid traverse to heads and rams. Morse Drives, on the Ultra-Lap Machine because they're more positive in action than any other type drive, were selected for the "Tank Mill" because they're tough and rugged, slip-proof.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA, N. Y. DETROIT, MICH. DIVISION BORG-WARNER CORP.

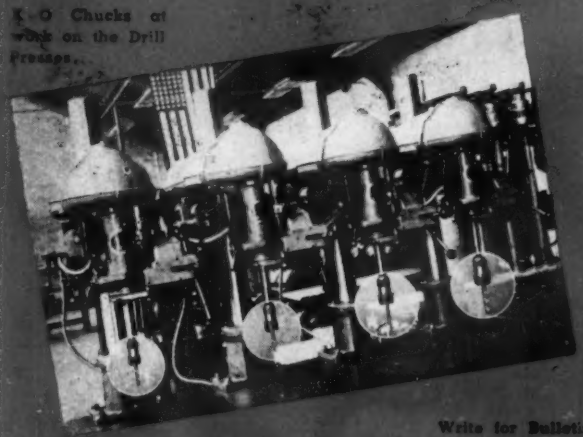
Knock-Out DRILL CHUCKS

KEYLESS SELF-ENERGIZING

● ALL Drill Chucks hold drills. But THERE IS A DIFFERENCE! K-O Chucks are built with specially heat treated, floating jaws which are your insurance for drill alignment and your guarantee against drill shank chewing. A twist of the finger tips is all that is necessary to tighten and hold the drill. From then on K-O Chucks tighten themselves. Another twist of the finger tips and the drill is released.

Made in five sizes to accommodate drills ranging in size from 0—7/8".

K-O Chucks at work on the Drill Presses...



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K. O. LEE CO.

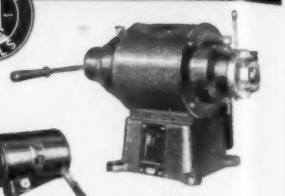
Aberdeen, South Dakota

SCHAUER ELECTRICAL TOOLS

. . . are better tools as a result of 36 years of progressive manufacturing. Use these IDEAL Tools in your shop.

SPEED LATHES

For finishing, lapping and burring operations on small parts. Many standard models: —hand or foot operated . . . completely automatic . . . air operated . . . infinitely variable speeds. Motors from 1/8 HP to 5 HP.



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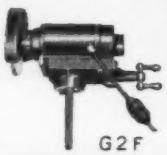

G2F

TOOL POST GRINDERS
For external and internal grinding: — on cutters, bits, spindles and similar work.

UTILITY GRINDERS
Bench or Floor Type AC or DC—1 HP, 1750 RPM ball-bearing, totally enclosed motor.

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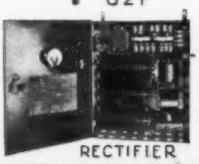

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ELECTROX RECTIFIERS
For converting AC to DC for all commercial purposes . . . copper oxide, selinium or bulb types.

"the originators of today's Speed Lathes"

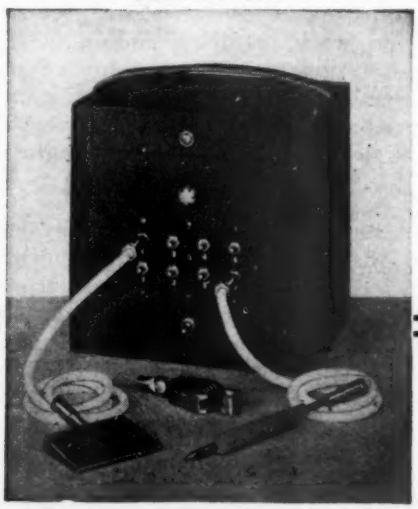
SCHAUER MACHINE CO.

2067 READING ROAD CINCINNATI, OHIO.

Why Not Buy the Original Electric Etcher?

MARK IRON and STEEL THE Etchograph WAY

3000 IN USE



Mark parts in process, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly.
Three sizes to meet all requirements.

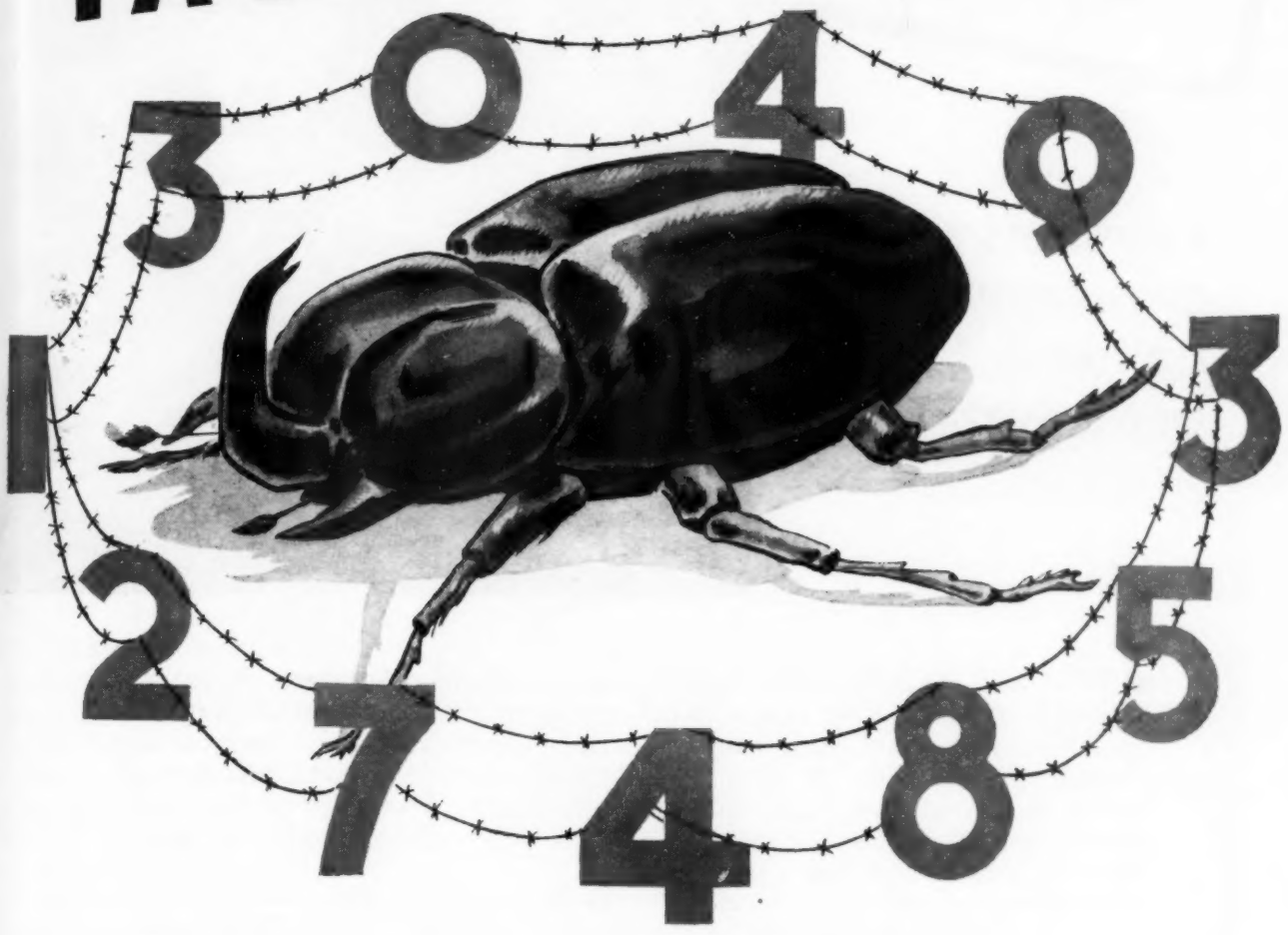
Write for circular and prices

BREWSTER-SQUIRES & CO.

Hudson Terminal Bldg. New York, N. Y.

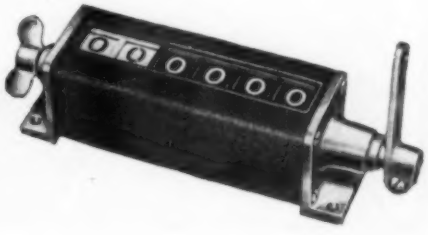
Fence him off with

FACTS·IN·FIGURES



There's not any room, today, for bugs in war production. Not even for the simple, routine bugs that only call for quick machine-adjustments. And particularly not for the japanese beetles and german plant lice of deliberate sabotage.

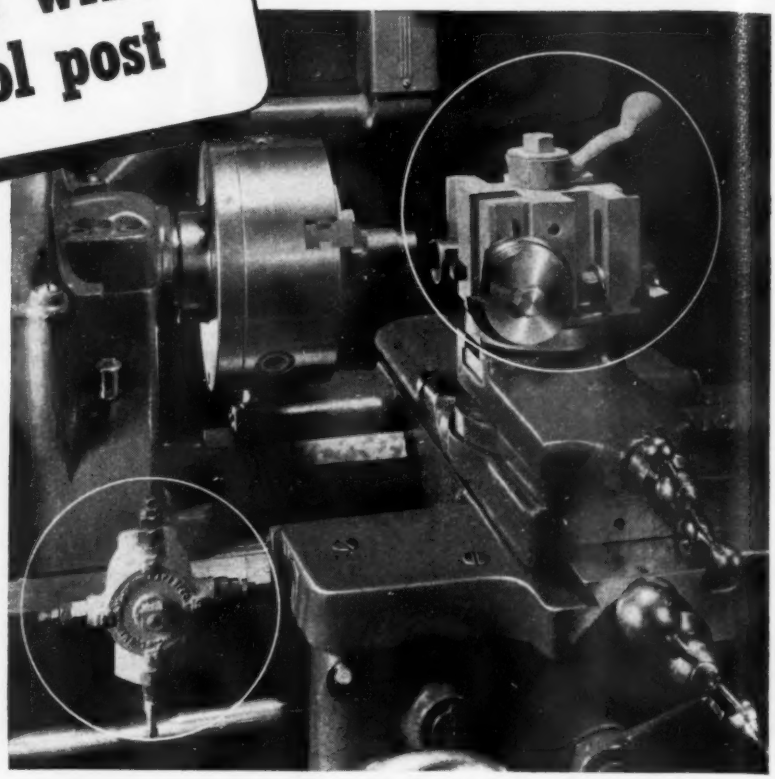
But there's room . . . *in fact, there's a definite place* . . . on every production machine for a Veeder-Root Counting Device that will put the finger on all kinds of bugs, as soon as they show themselves, and keep them from working into the danger zone. It's easy, quick, and inexpensive to give machines this protection . . . without disturbing schedules. And then you will have them equipped for effective *counter espionage*", so that they can warn your production men at the first sign of attack from any quarter. If your machines count heavily in the war effort, then you can count on Veeder-Root to help you, *right now*.



Veeder-Root Incorporated

HARTFORD, CONN.

Fit your lathe with this 4-way tool post



4 OPERATIONS WITH
ONLY 1 SET-UP
CLIP COSTS—
SPEED PRODUCTION

➡SPECIALTIES CROSS-SLIDE TURRET enables four operations on one lathe – no time lost for changing tools—ties up only one machine instead of four. Turret flips either clockwise or counter-clockwise from one index position to another. Locked solidly by clamp lever. Tool bits rotate to any angle above or below center to get the desired clearance angles on tools. Takes straight or circular tools.

➡SPECIALTIES LATHE STOP saves valuable time when performing multiple operations on lathe—measure only once for each operation. Automatically locked by spring pin—insures accuracy and efficiency. Fits any lathe with apron extension of 2¼" or more.

➡SPECIALTIES CROSS-SLIDE TURRET and SPECIALTIES LATHE STOP make a dependable team for cutting piece costs and stepping up production. For every operation, just set the lathe stop—eliminate all measuring and tool changing. Mail the coupon for detailed information on this flexible Specialties production team.

Please send me full information on SPECIALTIES lathe accessories.

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SPECIALTIES
MANUFACTURING COMPANY, Inc.
41 FARRAND ST. BLOOMFIELD, N. J.

Announcing the Improved

MURCHEY

Collapsible Machine Tap
Type "BM"

"For Threading to Extra Accuracy at Extra Speed"

4 WEEKS' DELIVERY

Sturdy—speedy—and entirely dependable. Always simple to operate—simple to adjust. Ready for quick conversion into either a rotating or stationary tool. With handle attached, Type "BM" provides a stationary or non-rotating tap on turret lathes and hand screw machines. By removing handle, it is ready as a rotating tap on drill presses or tapping machines. Its positive and quick operating action—a Murchey Engineering development—protects work, saves production time, increases machine capacity. Murchey tap collapsing mechanism insures instantaneous action. You get accuracy of thread length and you get thread protection in withdrawing tool from work.

Write for your copy of illustrated, descriptive booklet on Type "BM". There's no obligation—write today. Address Dept. A.

MURCHEY MACHINE & TOOL CO.
DETROIT 26, MICH.

Shop Executives
You NEED This New Type "BM" Catalogue!

MURCHEY

STELLITE HIGH-PRODUCTION CUTTING TOOLS *are Available for Prompt Delivery*

Stellite "98M2" and "Star-J-Metal" tools are widely used for machining steel, cast iron, and most of the machinable materials. These dependable tools take heavy cuts at high speeds and heavy feeds—with long life between grinds. This means high production at low cost per piece machined.

The types and sizes in which each grade is available, the purposes for which each type is recommended, and the correct grinding wheels to use are shown in the descriptive price lists illustrated below. Copies of any of these price lists will be sent on request.

Stellite "98M2" tools (left) were developed specifically for machining steel, and are also excellent tools for use on brass, bronze, and cast iron. They are hard, tough, and possess good edge strength.

Stellite Star-J-Metal Tools (right) are used on many materials, including steel and cast iron, for a wide variety of operations —including turning, boring, facing, milling, reaming, grooving and forming.

Standard Tools in Stock

SOLID TOOL BITS—Square, flat, or round . . . wide range of sizes . . . finish-ground ready for use in standard tool holders. Easily converted to various profiles.

WELDED TIP TOOLS—A variety of styles and sizes for use where solid bits are impracticable.

MILLING CUTTER BLADES—For many cutter body types, including Ingersoll, Kearney & Trecker, Modern, Production, OK, and Continental.

WEAR STRIPS—Haynes Stellite alloy castings brazed to a mild steel base, for attachment to boring, driving, and pilot bars to assure accuracy and long life.

Special Tools to Users' Specifications

Many types of special Stellite tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, counterbores, spotfacers, and reamers.

STELLITE
Reg. U. S. Pat Off.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

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• HIGH-PRODUCTION METAL-CUTTING TOOLS •

The words "Haynes Stellite," and "Stellite" are registered trade-marks.

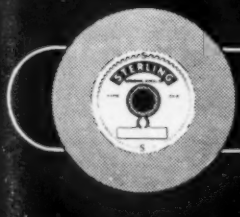
"FULL SPEED AHEAD" Is Today's General Order

★ ★ ★ ON the fighting fronts and throughout industry, full speed ahead is today's rule for victory. Speedy attacks against the enemy . . speedy production on the home front---these are of equal importance.

If industry, during the past months, has been able to break records, it is because of the excellence of equipment . . Sterling Grinding Wheels, for example! Built to do each individual job better and faster, these "Wheels of Industry" are a big factor in turning out all kinds of equipment to back up our armed forces.

"This is a grinding war," reports a well known trade journal. With full knowledge of this fact, every Sterling worker is doing his or her level best to get out more wheels quickly. Availability of grinding wheels means a lot in bringing victory nearer . . sooner! That is why we are turning out grinding wheels faster than ever before . . without compromising quality, of course!

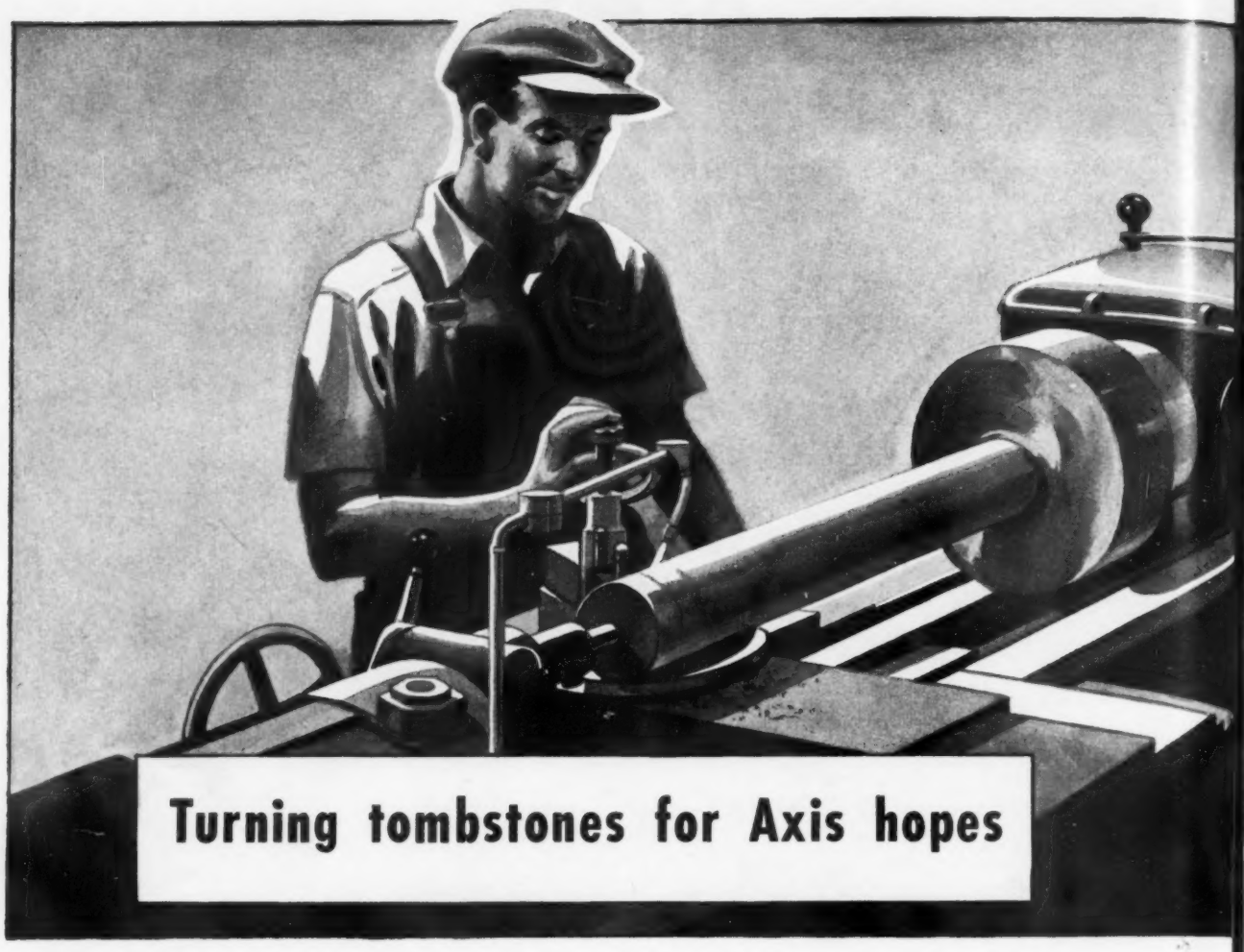
Increasing the speed and quality of your grinding is a problem Sterling engineers are well qualified to solve. Experienced by years of service to industry, Sterling engineers are a vital factor these days in keeping the "Full Speed Ahead" flags flying. Ask for their cooperation . . it will be gladly given.



• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

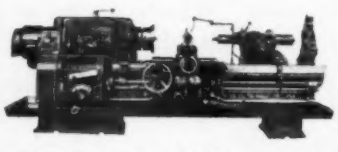
THE WHEELS OF INDUSTRY



Turning tombstones for Axis hopes

Three men were cutting stone for St. Paul's Cathedral, London. When asked what they were doing, one replied: "Cutting stone." The second said: "I'm trying to make a few shillings," but the third man stated: "I'm helping Sir Christopher Wren build a cathedral." Operators of Axelson Lathes are not cutting stone, but they *know* they're helping the fighting forces of the United Nations on the battlefront by turning tombstones for Axis hopes. These skilled machinists know that each precision turn of their lathes means the quickened defeat of a minority, hateful leadership that crushes, tortures and ruthlessly destroys the highest heritage of man — individual freedom.

And the men at Axelson, who build the lathes that later go into service turning parts for planes, tanks, transportation and munitions, are also deeply aware of their responsibilities. Theirs is the job of making an ever-increasing number of lathes with the quality standards not only required by war work, but with all the fine workmanship and proven materials that have always gone into finished Axelson Lathes. And when Axis hopes are buried, Axelson workmen, designers and engineers will contribute the knowledge gained during these pressure times to the building of better lathes that will help build a better world — cathedrals in metal.

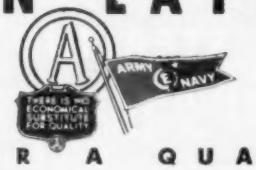


Axelson Lathes are built by men alert to machine tool progress, and who have a background of fifty years of manufacturing experience. Investigate the Axelson Line which includes 14, 16, 18, 20, 25 and 32 inch sizes in varying lengths.

AXELSON MANUFACTURING COMPANY
6160 South Boyle Ave., Los Angeles, Calif.
(P. O. Box 98, Vernon Station)
50 Church Street, New York City, N. Y.
3844 Walsh Street, St. Louis, Missouri

Buy More War Bonds For Victory

AXELSON LATHES

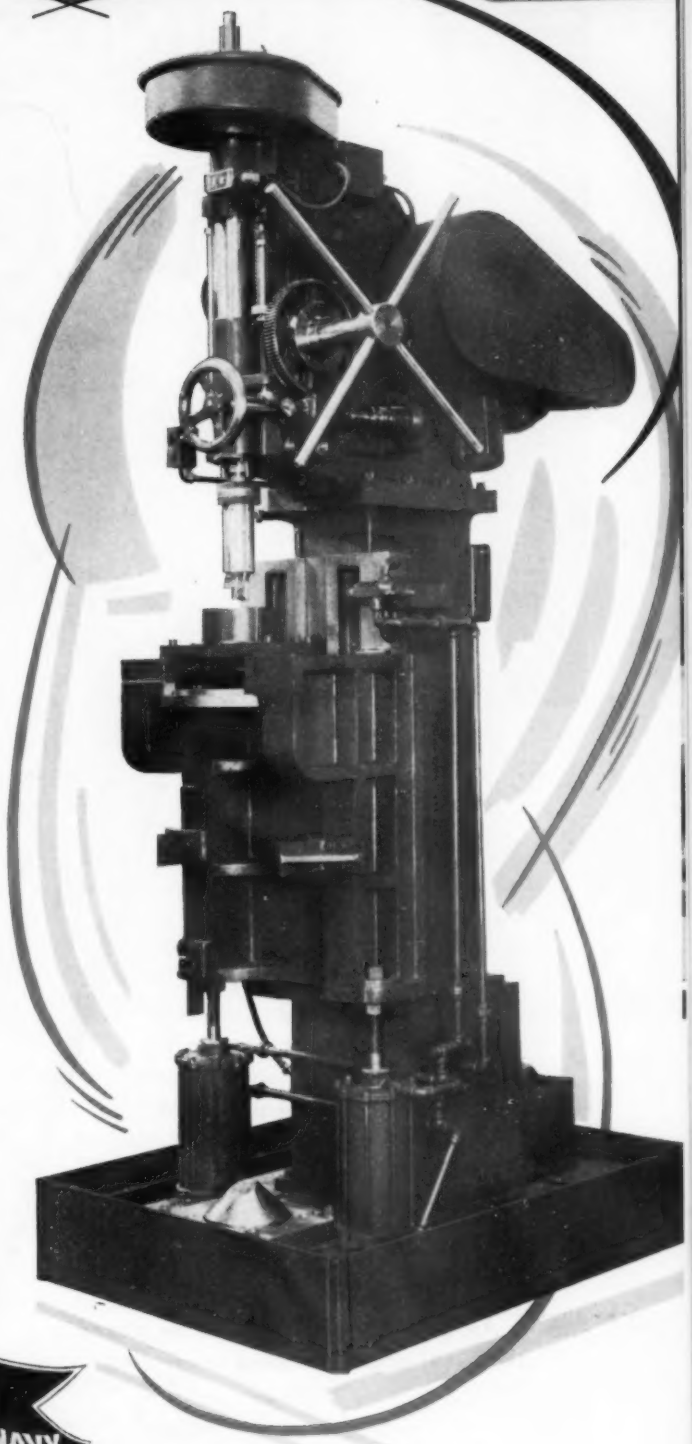


DEPENDABLE FOR OVER A QUARTER CENTURY

BAKER

Makes a new Contribution

TO THE WAR EFFORT



. . . in this special adaptation of BAKER MODEL 217. The unit as shown features a mechanical clearance and tooling to handle machining operations in the nose end of 500 lb. bombs. With extra adapters, machine will also handle 1000 lb. bombs.

Operations handled on this installation are:

Drill from the solid

Rough coredrill and rough face

Finish ream and face

Tap

A battery of these machines furnished to a leading producer of bombs are demonstrating extreme flexibility on various simple tool-ups.

One more example of BAKER's ability to furnish machines to do the job!

For efficient handling of special jobs now, and the assurance of future usefulness, specify BAKER units! BAKER BROTHERS, builders of special production machines, can solve your specific problems . . . write today for catalogs and engineering aid.

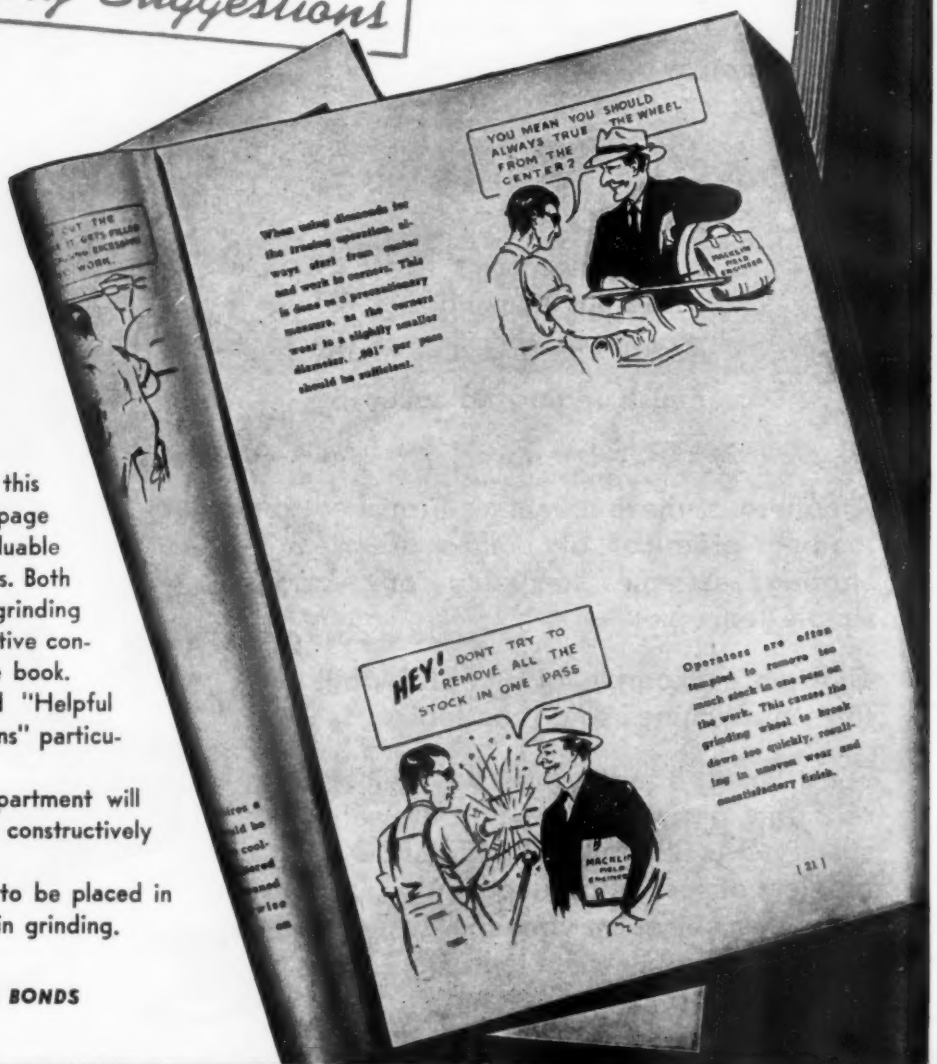
BAKER BROTHERS, INC. • Toledo, Ohio, U.S.A.

Our Motto Since 1867:
"Machines Sturdy and Efficient, as Fine as Can Be Built..."

DRILLING
BORING
TAPPING

MACKLIN GRINDING WHEELS

HELPFUL HINTS and Safety Suggestions


YOU MEAN YOU SHOULD TRUE THE WHEEL ALWAYS FROM THE CENTER?
When using diamonds for the truing operation, always start from center and work to corners. This is done as a precautionary measure, as the corners wear to a slightly smaller diameter. .001" per pass should be sufficient.
HEY! DONT TRY TO REMOVE ALL THE STOCK IN ONE PASS
Operators are often tempted to remove too much stock in one pass on the work. This causes the grinding wheel to break down too quickly, resulting in uneven wear and unsatisfactory finish.
[21]

FREE

INSTRUCTIVE BOOK

STILL AVAILABLE

Now in its third printing this Know How illustrated 64 page booklet has proved an invaluable aid to grinding departments. Both large and small users of grinding wheels welcome the informative contents of this comprehensive book.

New grinder hands find "Helpful Hints and Safety Suggestions" particularly useful.

Your entire grinding department will find its many concise facts constructively valuable.

Ask for sufficient copies to be placed in the hands of all interested in grinding.

★

INVEST IN WAR BONDS

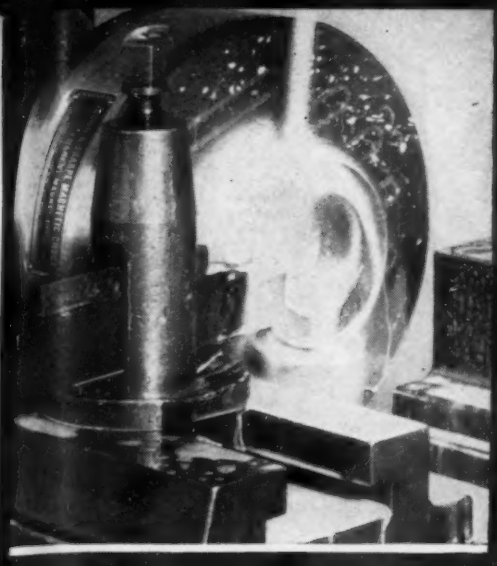
MACKLIN COMPANY

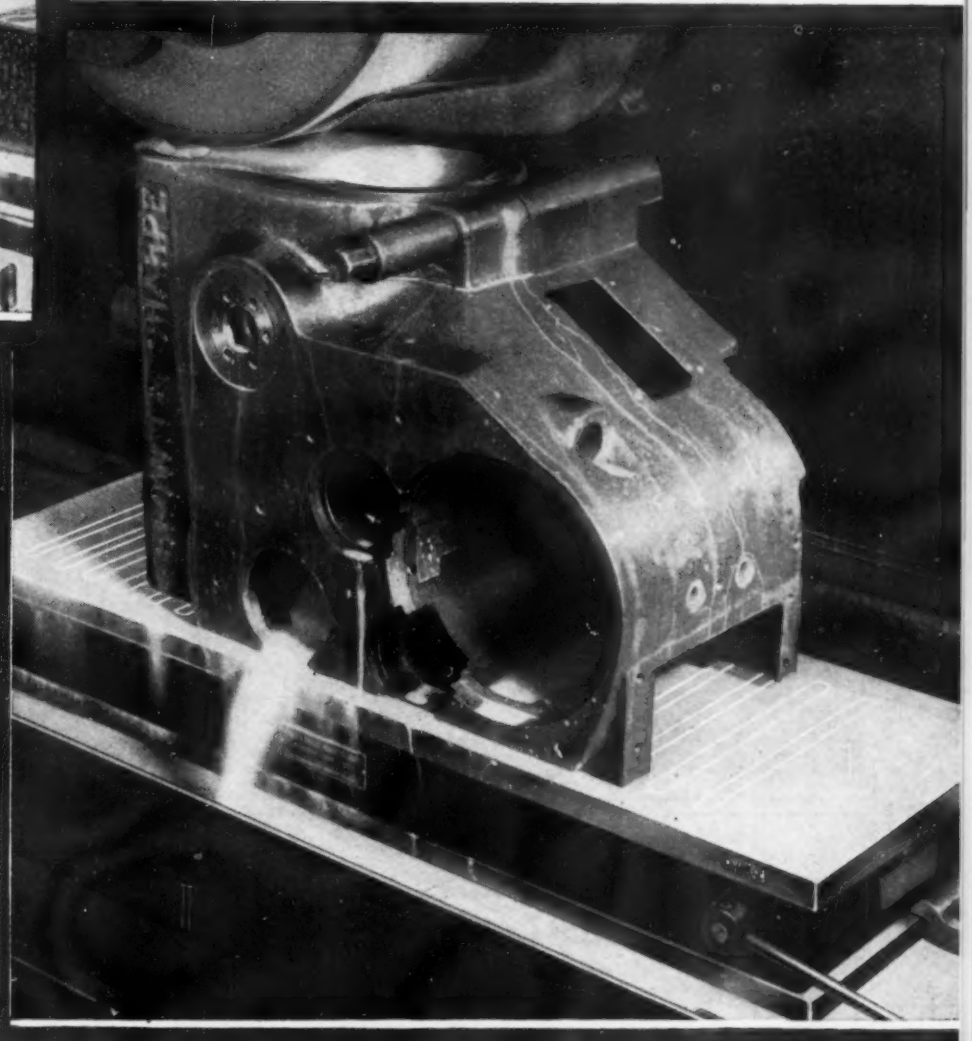
Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

Just Put Chuck on Machine and Start Work





.....No AUXILIARY EQUIPMENT

is needed with

PERMANENT MAGNET TYPE

MAGNETIC CHUCKS

—because Permanent Magnets Provide the Holding Power

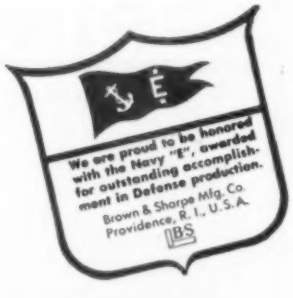
No complicated installations are required when you use Brown & Sharpe Magnetic Chucks of the Permanent Magnet Type. No special preparations are necessary — no wiring — no auxiliary current supply or generators. Simply place the chuck on the machine where it is to be used and commence work. Small sizes are transferred easily from machine to bench for hand operations.

Perhaps Brown & Sharpe Magnetic Chucks would help you in maintaining your production quotas in the armament program. Or their efficiency and simplicity of operation might aid in a saving of manpower. Complete range of sizes for all ordinary requirements. Magnetic chuck catalog sent on request. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

NO WIRES—NO HEATING—NO OPERATING COSTS

UPPER, 9" Rotary Model No. 9R holding work for light turning in lathe. This chuck, while especially suited for grinding operations, can be used for other light machine work.

LOWER, Rectangular Model No. 1236. This 12" x 36" chuck, the largest stock size in the line, is suited for large work or for groups of duplicate parts.

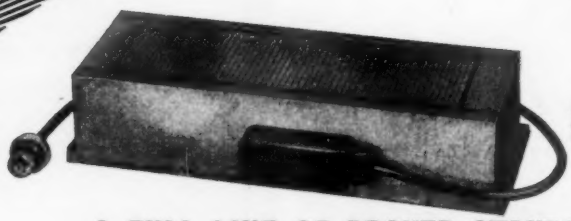

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U.S.A.
B&S

For sale only in the U. S. A. and its Territories and in Canada.

BROWN & SHARPE

WALKER MAGNETIC CHUCKS

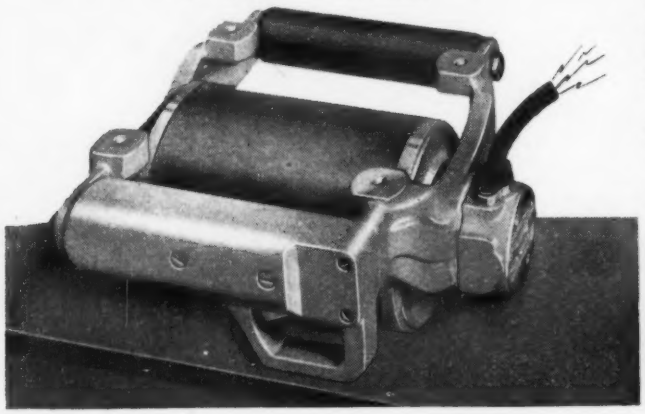
Style 8 Face Plate—in standard diameters from 10¾" to 36¾" inclusive.



No. 617 Bar Pole Face Rectangular Magnetic Chuck.

DEMAGNETIZERS

Walker DEMAGNETIZERS are available in standard D.C. and A.C. types for either 110 or 220 v. Ask for Bulletin K7 giving detailed specifications.



A FULL LINE OF PROVED STANDARD DESIGNS

Walker offers prompt and complete service on magnetic chucks by carrying in stock a considerable line of Rectangular and Rotary types for use on all surface and internal grinding machines built by American machine tool manufacturers. These units—for grinding, milling, planing and turning operations—are of proved design and are available in such a complete range of sizes as to enable you to select standard units for practically any chucking problem. Write for bulletin W4 giving detailed information.

Also special CHUCKS *for special* NEEDS

The design of Walker Magnetic Chucks is such that "specials" can be developed and furnished at prices only slightly more than standard units. If you require special magnetic chucks for special purposes, consult Walker and be assured of prompt, economical service.

O. S. WALKER CO., INC.

WORCESTER, MASS.

Don't Overlook This Possibility for Increased Production

★ ★ ★

Equip your shop with these economy tools for holding work while being machined. Hardened tool steel—precision ground.

NICHOLSON *Expanding* MANDRELS

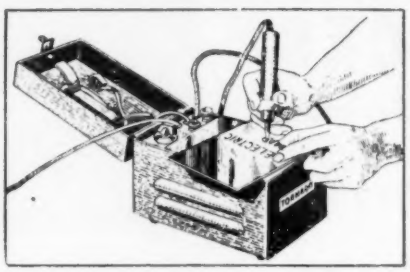
Save Time
Improve Shop Efficiency

Two types. All sizes. Sold singly or in sets Prompt delivery. Bulletin No. 14.

W. H. NICHOLSON & CO.

114 OREGON ST., WILKES-BARRE, PA.

Other Products: Arbor Presses—Control Valves—Steam Traps—Etc.

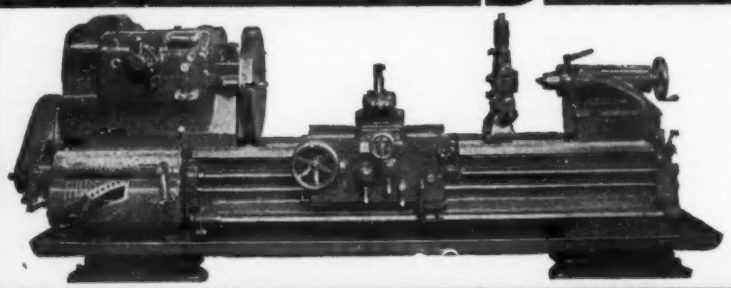


Protect Valuable Tools—Mark them with TORNADO Electric Etchers and Writing Tools

TORNADO Electric Etchers and Writing Tools mark everything of value that might be lost, misplaced or stolen. They mark iron, steel, brass, bronze, plastics, glass, etc. Convenient, easy and economical to use. ***WRITE FOR DETAILS***

BREUER ELECTRIC MFG. CO., 5084 N. Ravenswood Ave., Chicago, Ill.

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

"FIT FOR DUTY"

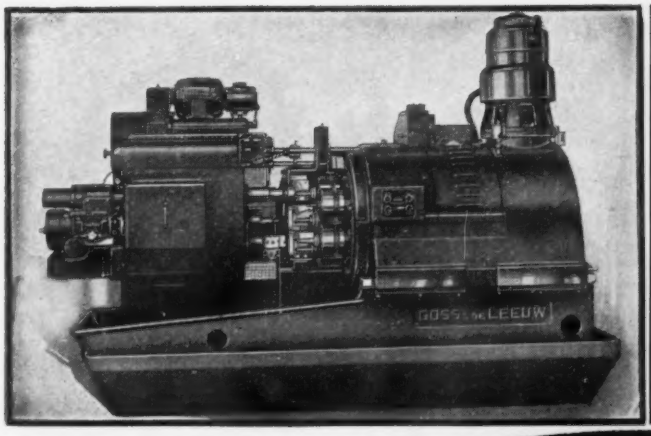
● Only first-class cutting tools can turn work out fast enough – and accurately enough – to be rated as "fit for duty" on today's vital production line!

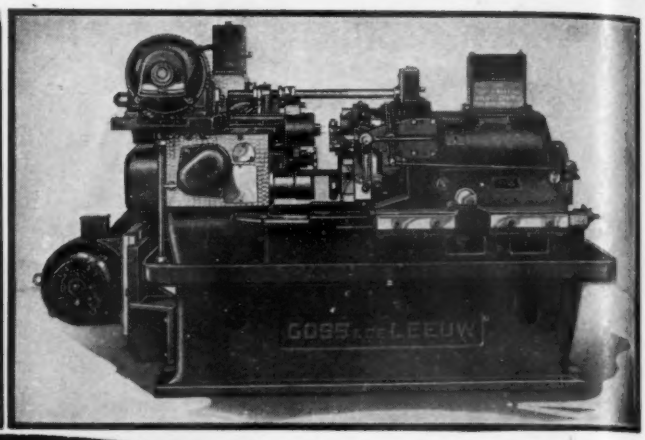
Ship worn-out High Speed Tools back to the steel mills – this high grade steel can do another war job.

MORSE THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

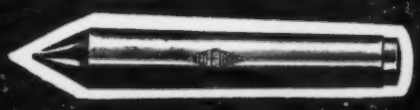
Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

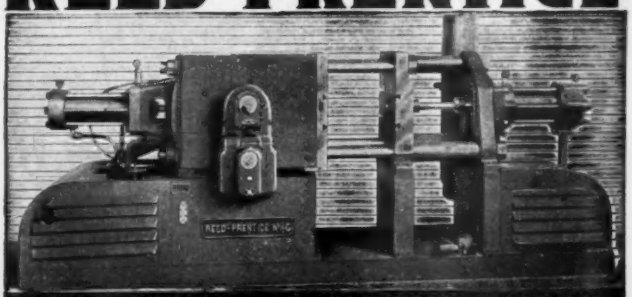
LONGER LIFE ASSURES LOWER COST

Red E Centers have high speed steel ends which enable them to outwear ten ordinary carbon steel centers. They quickly pay for themselves in faster speeds and longer life.



THE READY TOOL COMPANY
IRANISTAN & R. R. AVES. BRIDGEPORT, CONN.

REED-PRENTICE



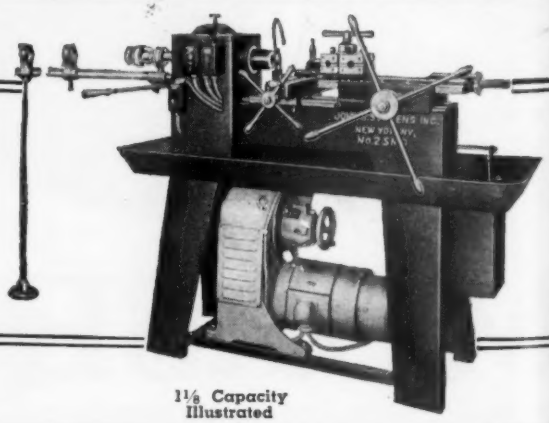
LATHES • DIE SINKERS • VERTICAL MILLERS • JIG BORERS
• DIE CASTERS INJECTION MOLDING MACHINES •
REED-PRENTICE CORP. WORCESTER, MASS., U. S. A.

STEVENS SCREW MACHINES

⅝ in. and 1⅛ in. Bar Capacities.
Simplified and Highly Efficient Motor Drive.
Write for bulletin.

•

Also makers of Multiple Spindle Index Centers, Rotary Tables, Milling Machine Vises.
THIRTY YEARS' EXPERIENCE



1⅛ Capacity Illustrated

JOHN B. STEVENS INC.
474 Canal St., New York, N. Y.

50 Years Pioneering...

....PREPARED BAUSH ....FOR ITS IMPORTANT ROLE IN TODAY'S WAR PRODUCTION

Always a pioneer* in developing ways and means for faster, more accurate and more convenient handling of essential machining operations, Baush was ready for the war effort even before Pearl Harbor.

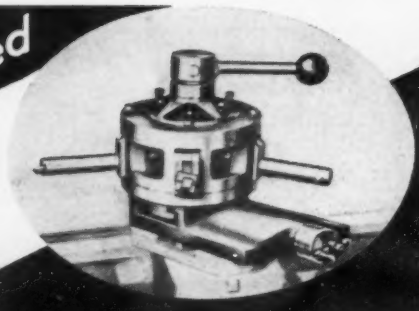
Recognition of the fact that Baush machines can and do play an important part in speeding war production is an incentive which keeps the Baush pioneering spirit constantly on the alert in its efforts to realize still greater achievements in its machines for the benefit of the metal working industry.

BAUSH MACHINE TOOL COMPANY
Springfield, Mass. Detroit, Mich.

* Baush over a period of 50 years has made many contributions to metal working through improvements incorporated in its Multiple Spindle Drilling, Tapping and Boring Machines and special equipment.

Improved

5-STATION TURRET HEADS



HANDLE 5 SEPARATE OPERATIONS ON ENGINE LATHES WITHOUT RESETTING WORK . . . .

Even inexperienced lathe hands can quickly become fast operators when you convert your engine lathes into production machines with these simple, sturdy, easily handled Improved Turret Heads.

Five stations are provided, each with a tool block which permits rotating and tilting tools for proper setting. By merely moving handle 1/8th turn and lifting it 45°, the head can be rotated in either direction to any one of ten indexed positions. Ordinary tool bits fit directly into tool holders without requiring special adapters, thus saving tool bits, assuring rigidity and making heavier cuts possible. Boring bars can be used.

Improved Turret Heads are available for any lathe from 6" to 30" Swing and are easily set up.

Now is the time to get maximum production from your lathes.

Write today for Descriptive Bulletin giving full details.

AUTOMATIC MACHINE & TOOL CO.
132 Charles St., Auburndale, Mass.

REID Hand Feed Surface Grinder No. 2C

Equipped with Motorized Spindle

A Proven Product for Over a Quarter Century with Thousands in Use Daily

Send for Descriptive Literature
EXCELLENT DELIVERIES

Exclusive Selling Agents
H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

SHELDON BBU-1240 WQ
Precision Lathe

★ This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.

★ If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE CO., INC.
4234 N. Knox Ave. Chicago, U.S.A.

Keep this Point in Mind

FEATURES of SUPERIORITY

Ball and Roller Bearing

MOTOR TOOL LIVE CENTERS

are as nearly FRICTION-FREE *as scientific engineering can make them*

Chances are you will wear out a dozen "dead" centers before you even have to dress the point of a MOTOR TOOL. And, in a MOTOR TOOL, there still are years of service if run at rated loads and speeds.

a vital point to keep in mind when buying centers

MOTOR TOOL MANUFACTURING CO.
METAL CUTTING TOOLS
7777 CORTLAND AVENUE · DETROIT, MICHIGAN

Make it a Rule to Call Motor Tool

DALZEN *Broaches*

ROUND AND FLAT . . . IN A COMPLETE SIZE RANGE

For maximum parts per grind plus maximum grinds per broach specify Dalzen broaches.

Dalzen broaches are ground from your blueprints by precision craftsmen with years of experience in broach making. Flat broaches are available in any size; round broaches, in any size up to 72".

When ordering, give make and number of machine, length of stroke, and type of holder.

A DALZEN WILL DO IT! Dalzen tools — taps, flat and round broaches, thread milling hobs — have the same high reputation for accuracy and dependability as Dalzen Thread Grinders and Center Lapping Machines. Sturdy, compact, efficient, Dalzen machine tools give maximum production per cubic foot, per pound, per dollar of cost! Write for descriptive literature.

DALZEN IN AIRCRAFT

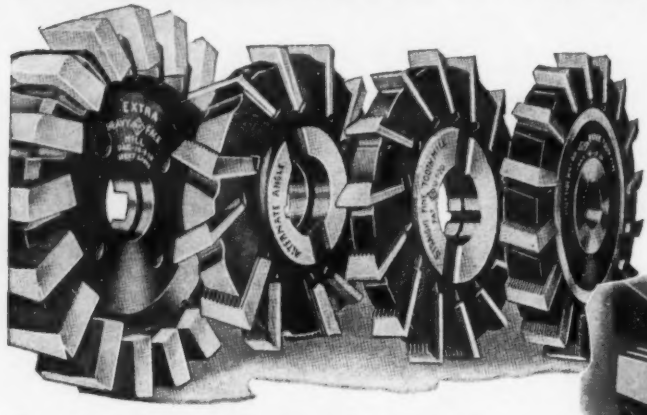
Ground thread parts are being produced on contract for leading aircraft engine manufacturers. For detailed data on this service, submit blueprints and specifications when making inquiry.

DALZEN

TOOL & MANUFACTURING CO.

12255 EAST 8 MILE ROAD • DETROIT

In The Business of War, Use Tools That "FIGHT"!



TIME SAVED MEANS SCHEDULES MET!

These Tools CONSERVE H. S. STEEL

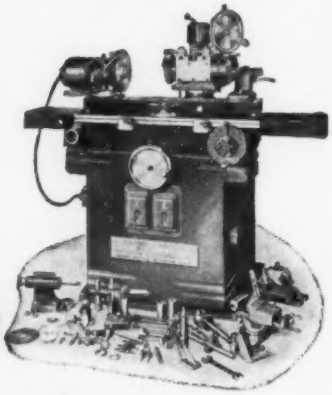
No modern battle is won with cross-bows and battering rams! And no one should attempt to handle war production with antiquated cutting tools. O K Inserted-Blade Metal Cutting Tools are tools that "Fight," because they place at the operator's disposal an adequate supply of highest quality, properly ground cutting edges. That's "ammunition" that speeds up the work. And as only the blade or tool bit is made of high speed steel, the drain on that valuable metal is reduced to a mere trickle!

THE O K TOOL CO., SHELTON, CONN.

THE TRADE OK MARK SYSTEM
OF INSERTED-BLADE METAL CUTTING TOOLS

O K Tools bought now for war work will be just as valuable in your coming peace time program, hence are a wise investment, not a war time expense.

GRAND RAPIDS



ULTRA MODERN CABINET BASE
TOOL and CUTTER GRINDER

with

BALL BEARING TABLE AND OTHER EXCLUSIVE FEATURES

★ ★ ★

EXTREME FLEXIBILITY FOR COMPLEX GRINDING OPERATIONS

GALLMEYER & LIVINGSTON CO.

330 Straight Ave. S. W. Grand Rapids, Mich., U. S. A.

DON'T WAIT FOR TURRET LATHES

Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing.

● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

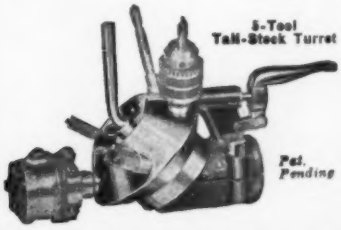
6 Days Delivery

Pat. Pending

4-Tool Tool-Post Turret

● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (below right), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

The Jefferson Bull-Dog Precision Milling Machine. Obtainable Power or Hand Feed.



5-Tool Tail-Stock Turret

Pat. Pending

● **ALSO—*Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.***

JEFFERSON MACHINE TOOL CO.

SO. SWEENEY, CUTTER & FOURTH STS. CINCINNATI, OHIO

When Factories are Fortresses...

● Cutting tools are the weapons with which weapons are made. ● The craftsmen who build National cutting tools ask you to keep them fighting by keeping them working. Keep them working by keeping them sharp!

NATIONAL

NATIONAL TWIST DRILL & TOOL DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

HOME OFFICE AND FACTORY—DETROIT, MICH.

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

"Blount"

"COMBINATION" MODEL J

WET TOOL GRINDER

meets todays need for speed and accuracy

This machine is a valuable contribution to fast production. It is equipped with straight faced wheels for wet grinding, is remarkably convenient in operation and can be depended on for cool, clean grinding.

Modern and improved features include:

. . . heavy column with ample coolant tank and water pan of generous capacity.

. . . guards of heavy cast iron with hinged covers and adjustable spark protectors.

. . . centrifugal motor-driven ball bearing pump with all bearings above water line.

. . . spindle of high carbon steel, machine turned and ground.

. . . deep groove ball bearings protected against grit.

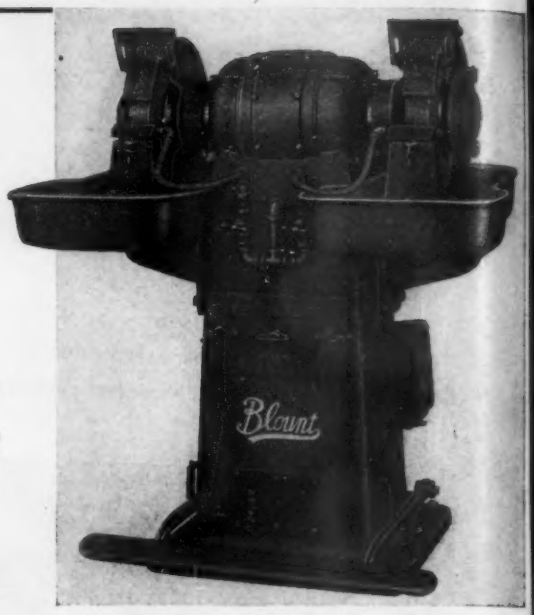
. . . exclusive design Blount grinding rest incorporating coolant ejector which assures cool tools and clean wheels.

. . . totally enclosed motor with manually operated switch having overload protection.

. . . foot treadle switch (available as an extra) keeps machine running only while operators foot depresses treadle.

Write for Bulletin A-8

COMPLETE DETAILS AVAILABLE ON REQUEST



CONDENSED SPECIFICATIONS

Base of Column—22" x 19½"
Height base to spindle—37½"
Spindle Arbor—1¼"
Wheels 12" x 2" x 1¼"
Between wheels—22½"
Spindle speed—1750 R.P.M
Motor—2 HP.

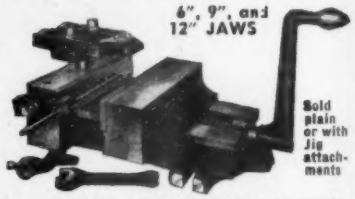
J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

Carbide and Diamond-tipped
GAGES AND TOOLS
GUARANTEED QUALITY

ARTHUR A. *Crafts* COMPANY, INC.
Chicago 532 COMMONWEALTH AVE. *Detroit*
Boston

GRAHAM MULTI-PURPOSE VISE

In sizes for light drilling to heavy-duty planer and shaper jobs, this vise serves a variety of uses on a variety of machines. Attachments permit use for repeat-operation positioning instead of special jigs or fixtures.



KNURL HOLDER FITTING LATHE TURRET

A pair of straight Knurls produces straight, spiral, or checkered patterns in this any-angle tool handling work up to 2½" dia. Shank to fit your turret.

Request Illustrated Price Circulars

GRAHAM MFG. CO. 88 BRIDGE STREET EAST GREENWICH, R. I.

Rugged . . . Accurate Versatile . . . and Fast!

With these four qualities combined in perfect proportion, Cincinnati Lathes are capable of high production to the exacting standards required in aircraft, munitions, and other war work. Send us details of your war production jobs and let us help you tool up for maximum lathe output. Cincinnati Lathes supplied in 14" to 30" sizes. Write for latest catalog.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley Cincinnati, Ohio
SPECIALISTS SINCE 1906

THE RIGHT SAW FOR EACH JOB

• Using the proper band saw means saw life is doubled and trebled in many cases—jobs are finished quicker and smoother.

Use only DoAll Band Saws according to the DoAll Job Selector and save money and man hours. Right now that's not only patriotic, but good business. With the Selector Dial anyone can tell instantly the right saw and speed for each kind of material.

FREE SAW CLINIC—If you have an unusually tough job that is slowing down production or ripping out saw teeth, send it to our Laboratory for free analysis and written report. Or, consult our factory trained engineer in your locality for valuable aid right in your own plant on your own work.

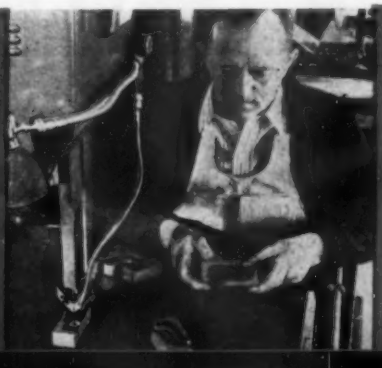
Send for new book "DoAll Precision Saws". Lists styles and sizes of DoAll Band Saws and gives case histories of various hard-to-saw jobs. You'll find it interesting and helpful.

THE DOALL COMPANY
1210 Thacker St., Des Plaines, Ill.

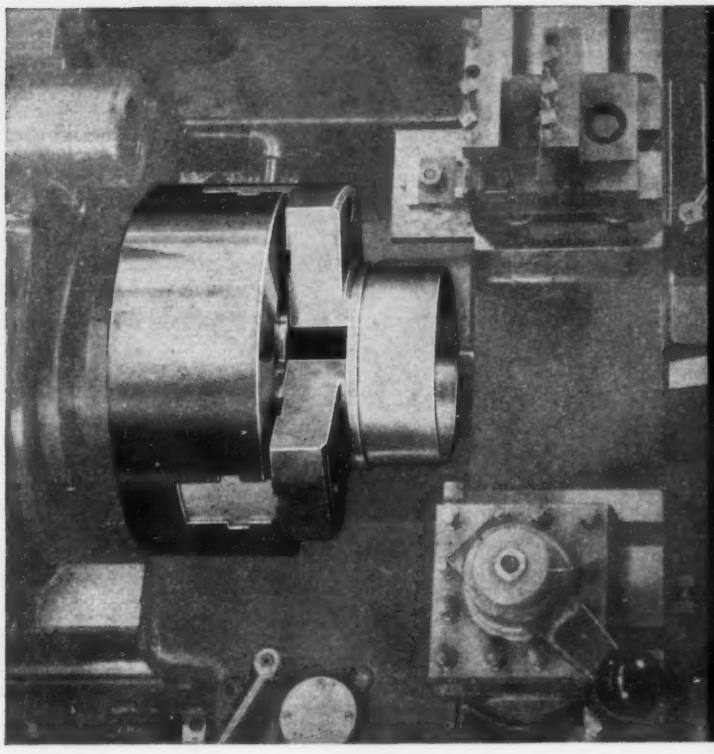
DoAll Offices in 25 cities, each in charge of a trained sales engineer to give you quick service on Band Saws and Files, Contour Machines, Gage Blocks and Surface Grinders.

FORGED STEEL GUN BREECH
7½" high. Sawed with a ⅜" saw, A temper, 8 pitch. .042" Raker set. Speed, 125 f.p.m.

STACKED METAL SHEETS
Two stacks 3-32" thick, 30 pieces were completed with the right saws in 1½ hours.



BOLT LOCK PARTS
To save materials, parts were laid out in pairs. Each pair was finished in 5.62 minutes.



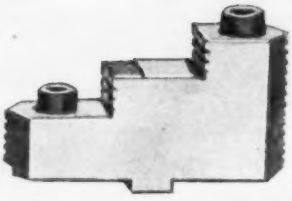
tough HOLDING PROBLEMS *easily solved*

with American Standard Two-Piece Jaws and Soft Blank Top Jaws

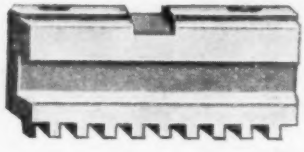
● Jaw equipment exactly fitted to the requirements of an individual part naturally makes it very much easier for operators to work quickly and accurately and is an important factor in repetitive production. Furthermore, jaws can be so arranged that the grip will be in correct relation to tool pressures and in such a manner that already finished surfaces will not be marred.

With chucks equipped with American Standard 2-piece jaws, this is very easily and inexpensively accomplished by the use of soft blank top jaws, individual sets of which can be machined to exactly the right form required for the work to be held. These top jaws are then simply bolted in place on the master jaws remaining in the chuck body and can be quickly changed as required to handle different parts in production on the same machine. This almost entirely eliminates the need for special jaw fixtures, saving time and material, simplifying machine set-up.

Our engineering department is always ready to help you in working out difficult holding problems. Do not hesitate to call on us. The Cushman Chuck Company, Hartford, Conn.



REVERSIBLE TOP JAW



MASTER JAW

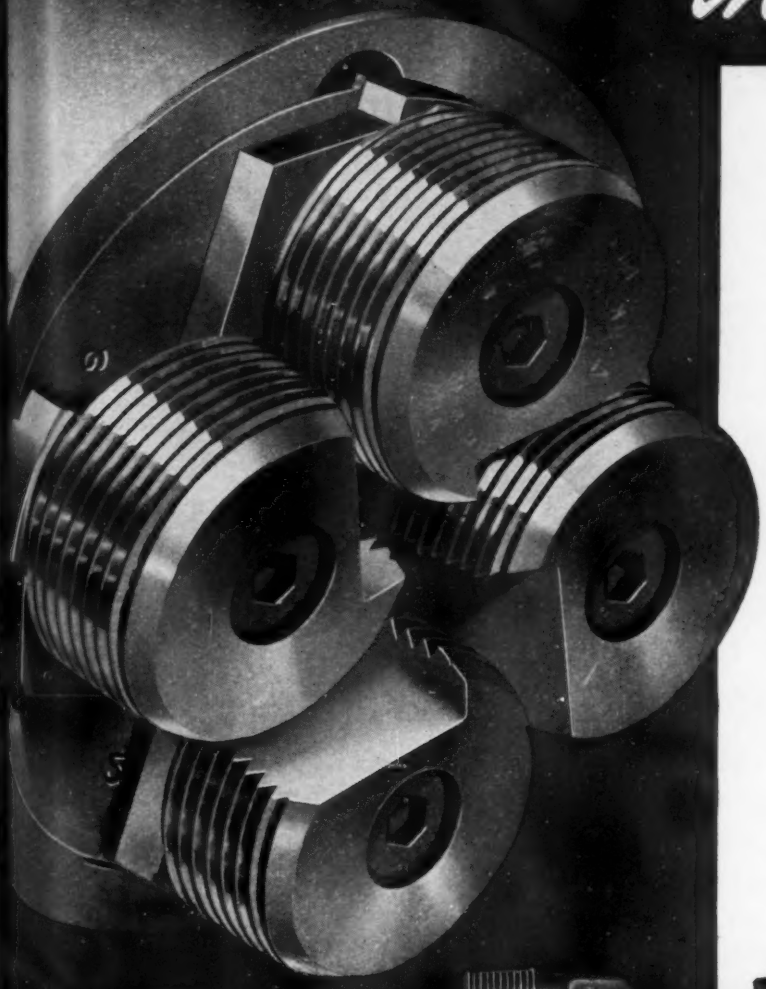
SOFT BLANK JAW

CUSHMAN

A World Standard for PRECISION

These small "Chuck Check" maintenance cards can be given to operators or put on bulletin boards. They'll help save time, save chucks and reduce spoilage. Ask us to send you some.

in less time

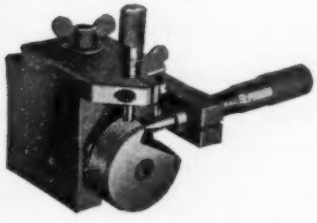


More and more men who have tight schedules to maintain are using Namco Circular Chaser Die Heads. They will tell you that these tools will turn out more work—per hour or per day. Class 3 threads, too, on a production basis.

Chasers are reground on blocks. Inserting a duplicate set in head is a two-minute job, and you are ready to cut identical threads, without "trying for size" and without work spoilage.

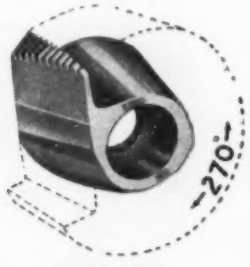
In the same rigid head, circular thread chasers may be interchanged with hollow milling cutters and blocks.

Capacities: .056″ to 4⅞″—revolving or stationary type. Send for Catalog D-42.



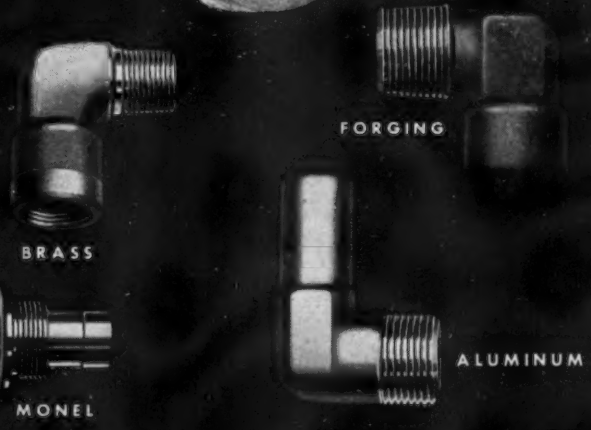
Namco Micrometer Gauge

determines correct amount of metal to remove for Circular Chaser grind, and double-checks precision after grinding.



Namco Circular Chasers

may be ground through 270° of circumference. They last 10 to 30 times longer, with no loss of precision.



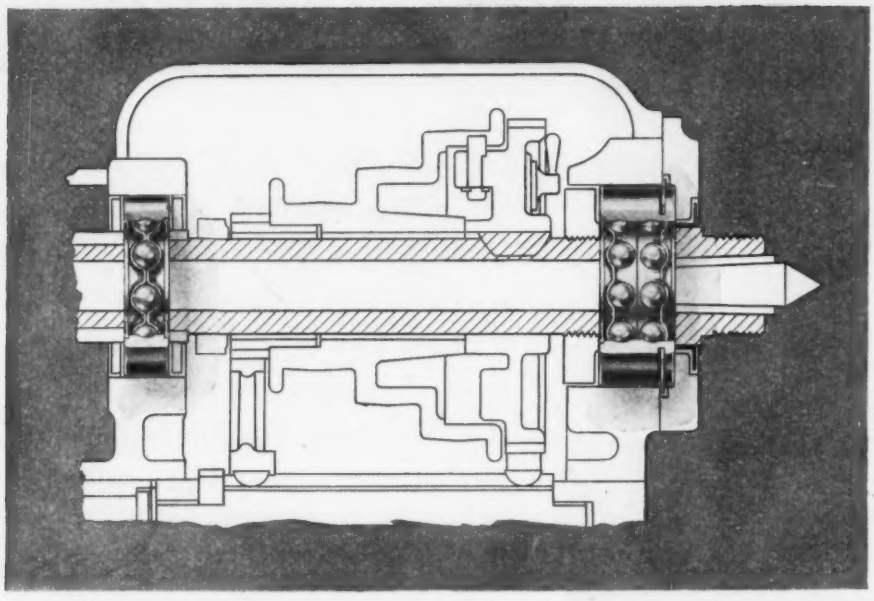
THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

SUSTAINED *Spindle Accuracy!*

☆ A FINER FEATURE OF LOGAN LATHES



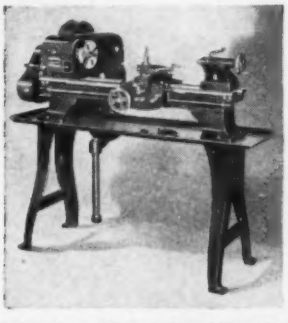
Brief SPECIFICATIONS

- Swing over bed 10½"
- Bed length 43⅛"
- Spindle hole 25/32"
- Precision ground ways: 2 prismatic "V" ways; 2 flat ways
- 12 spindle speeds—30 to 1450 per minute

Precision, Pre-Loaded Ball Bearing Headstock is Standard Equipment on All Models

Your purchase of a lathe is an investment. To be profitable, it should be a *long term* investment in speedy, accurate production. It will be if the lathe is a Logan, because Logan engineering designed it that way... throughout! For example, to assure sustained accuracy of the spindle, the headstock is equipped with special New Departure Ball Bearings. These bearings, of extreme precision, are pre-loaded so that the pressure of the cutting tool... either radial or thrust... causes a minimum deflection of the spindle. In addition to "pre-loading"... these ball bearings are grease sealed... requiring no lubrication and no adjustment for their entire life. Moreover, the higher operating speed of the Logan Lathe, due to its ball bearing spindle mounting, enables a shop to take every advantage of modern, high speed cutting methods. Production is increased and unit costs reduced.

Write for catalog sheets so that you can compare before you buy.



NO. 200 BACK GEARED SCREW CUTTING LATHE

NO. 850 MANUFACTURING TURRET LATHE

NO. 830 ⅝" CAPACITY HAND SCREW MACHINE

LOGAN ENGINEERING COMPANY
CHICAGO, ILLINOIS

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

HOVIS

UNIVERSAL MASTER WASHER DIES

The New Economy Method of Making Washers

Eliminate:

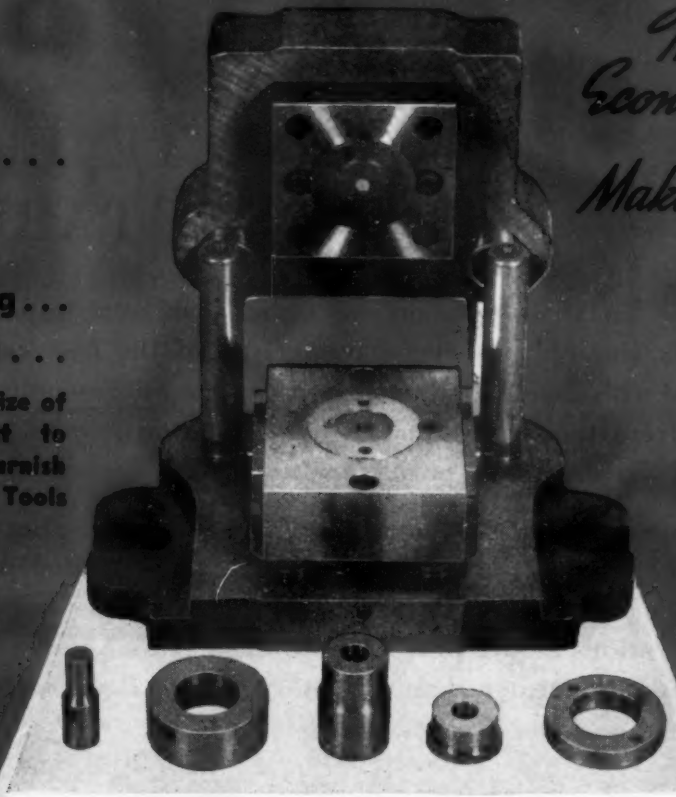
All Process Engineering . . . .

All Tool Designing . . . .

All Tool Making . . .

All Die Tryout . . .

Simply tell us the size of washer you want to make and we will furnish the complete Set of Tools



Hovis makes four sizes of Master Washer Dies. Each die is complete in itself, ready to use, and is made on an all-steel precision standard die set and comes complete with stock gauges and stops. From these dies it is possible to remove five small interchangeable parts without dismantling the die. These parts are held in place by the patented Hovis Screwlock principle, the same as is used in holding interchangeable punches and button dies. Once the initial investment is made in Master Washer Dies of the sizes to meet your requirements, five small interchangeable parts are the only parts necessary to purchase in order to make any size washer.

Write for Folder

HOVIS SCREWLOCK COMPANY

8098 E. NINE-MILE ROAD . . . VAN DYKE, MICHIGAN Suburb of Detroit . . . Phone: CENTERLINE 1575

IT'S THE *Finish*

That Provides the

LONGER ACCURATE LIFE of LINCOLN PARK GAGES

IN ANY GAGE, surface finish is of vital importance. Without the extremely smooth surfaces characteristic of the best gages, sliding friction produced with gage use soon wears away the microscopic irregularities which project from the solid metal. This wear soon results in a change in gage size, and the gage is of no further use for its particular inspection purpose.

At Lincoln Park, careful control in grinding and lapping produces gages with extremely high finish. A large department, operated under ideal working conditions and staffed with highly skilled men and women, is devoted to lapping operations alone. Here Lincoln Park Class XX and X gages are finished with Profilometer readings no greater than 1.5 microinches. Readings no greater than 2.5 microinches are guaranteed on Class Y gages.

Lincoln Park Finishes Measured in FRACTIONS of A Microinch

No smaller measurements can be made of surface roughness than those which are secured in the Lincoln Park plant. In constant use is a special Profilometer which incorporates an extra step in its range of sensitivity. It is adapted to the measurement of surfaces three times as smooth as those which can be measured by the standard instrument. Many of the finishes produced by Lincoln Park require this extremely accurate inspection.

ARMY (E) NAVY

LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

For HIGHER PRECISION .. *FASTER*

No. 2 TURRET LATHE

A production standby, the Simmons No. 2 Turret Lathe handles an infinite number of diversified parts with very little special tooling items. Low in cost, it produces close-tolerance work speedily and economically. The MICRO-SPEED Drive offers unlimited speed variations while the spindle is in operation, enabling quick selection of the speed best suited to the work and cutting tools. Made in Plain and Back-geared types (the latter illustrated). *Write TODAY for details and delivery dates.*

SPECIFICATIONS

BAR CAPACITY—1¼"; SWING OVER BED—14"; SWING OVER CROSS-SLIDE—6".

For SMALL PARTS PRODUCTION

No. 1A MILLING MACHINE

Inexperienced operators quickly learn to produce small, high-precision parts on the Simmons IA—whether long production runs or small-lot work with frequent set-ups. Through MICRO-SPEED, an infinite number of speed changes can be made while the spindle is in motion by means of the Selector Dial. *Write TODAY for details.*

SPECIFICATIONS

SPEEDS—64-710 R.P.M.; RANGE OF FEEDS—Horizontal—34", Cross—8", Vertical—18½".

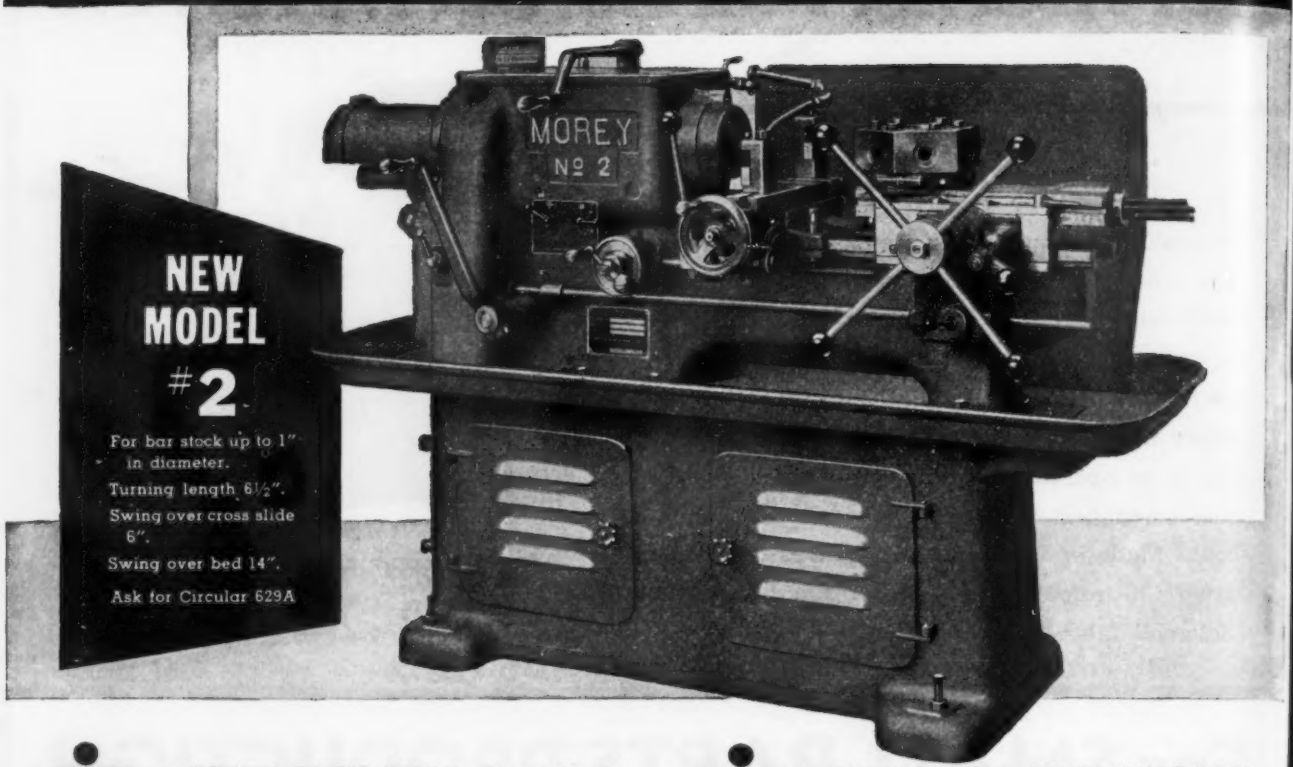
SIMMONS MACHINE TOOL CORPORATION

Main Office: 1759 NORTH BROADWAY, ALBANY 1, N. Y. *New York Office:* 149 Broadway.

SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

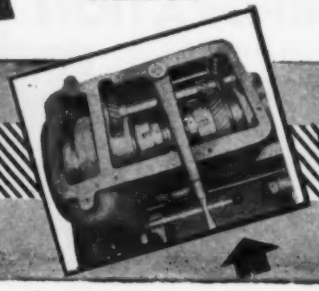
MOREY TURRET LATHES



NEW MODEL #2

For bar stock up to 1" in diameter.
Turning length 6½".
Swing over cross slide 6".
Swing over bed 14".
Ask for Circular 629A

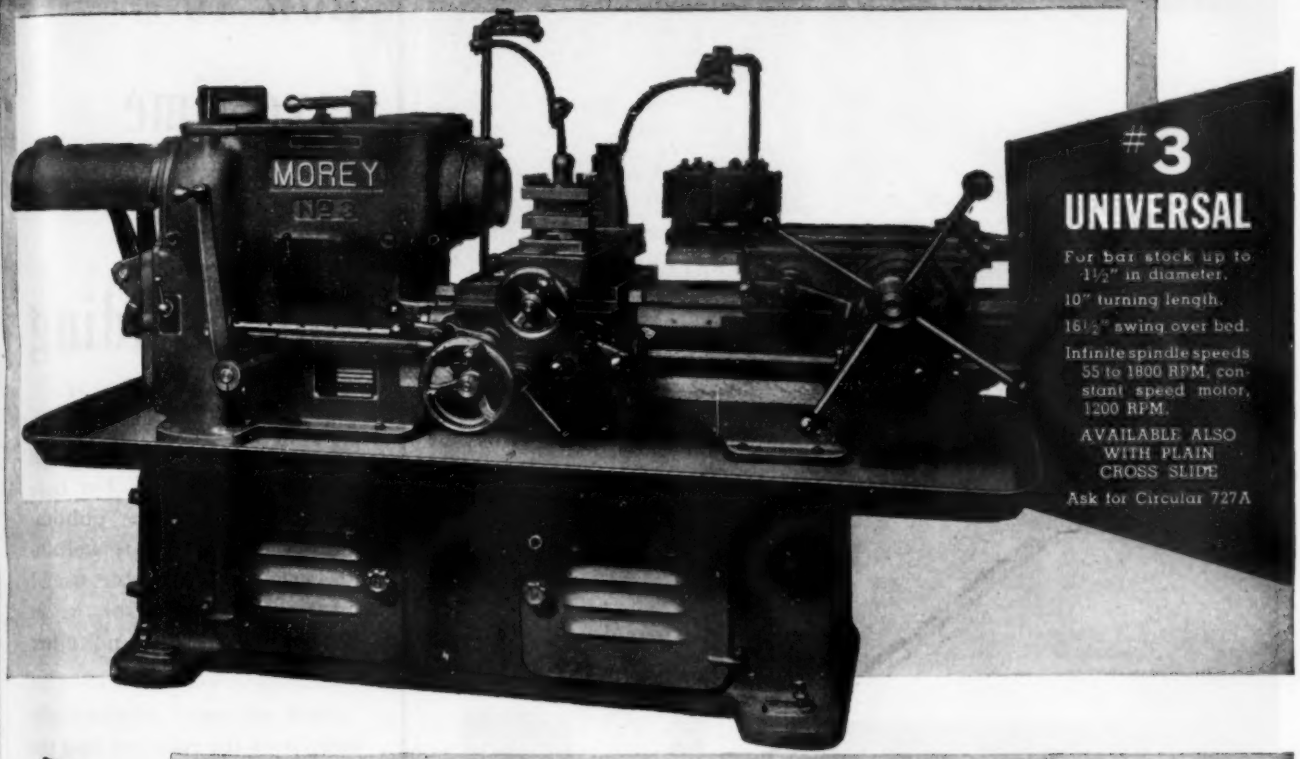
- INFINITE SPINDLE SPEEDS – Electrically Selected—Minimum of 60 RPM.
  Maximum of 2000 RPM.
  Constant horsepower at all speeds.
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
  SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.
- BED MOUNTED ON CABINET BASE
- MOTORS AND STARTING EQUIPMENT EASILY ACCESSIBLE.
- HEXAGON TURRET AUTOMATICALLY UNCLAMPED, INDEXED AND CLAMPED.
- THREE TYPES OF CROSS SLIDES AVAILABLE:
  Lever Feed
  Screw Feed
  Combination Feed*
  *Combination feed provides instantaneous selection to either lever or screw feed.
- EIGHT (8) FEED CHANGES FOR THE UNIVERSAL CARRIAGE and HEXAGON TURRET, INSTANTLY ENGAGED OR DISENGAGED BY ONE MOVEMENT OF THE LEVER.



"EARLY DELIVERY"

MOREY
410 BROOME STREET

for BAR *or* CHUCKING { UNIVERSAL *and* PLAIN



#3 UNIVERSAL

For bar stock up to 1½" in diameter.

10" turning length.

16½" swing over bed.

Infinite spindle speeds 55 to 1800 RPM, constant speed motor, 1200 RPM.

AVAILABLE ALSO WITH PLAIN CROSS SLIDE

Ask for Circular 727A

#4 UNIVERSAL

For bar stock up to 2" in diameter.

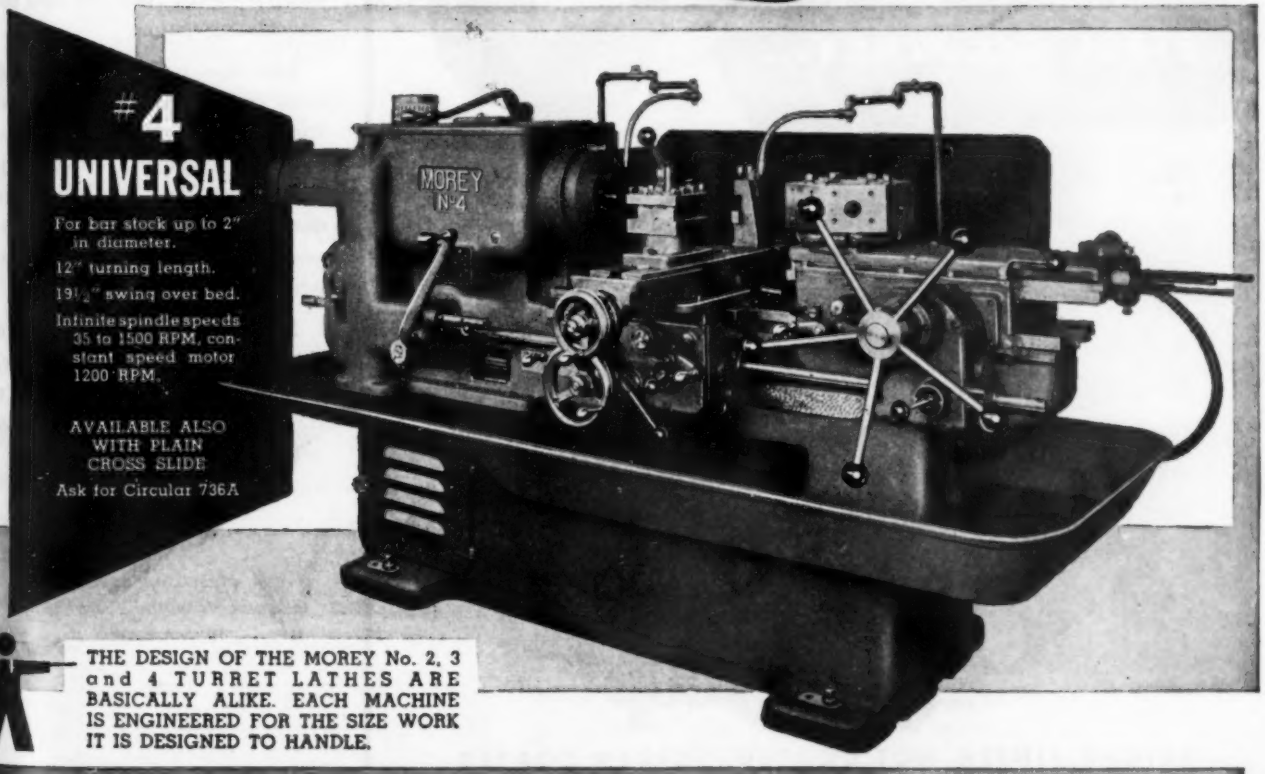
12" turning length.

19½" swing over bed.

Infinite spindle speeds 35 to 1500 RPM, constant speed motor 1200 RPM.

AVAILABLE ALSO WITH PLAIN CROSS SLIDE

Ask for Circular 736A



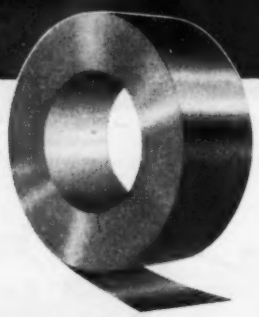
THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

MACHINERY CO., INC

NEW YORK, N. Y. *Plant* 4-57 26TH AVE., ASTORIA • NEW YORK

SPLIT-SECOND ACTION DEPENDS ON

STEEL ACCURACY...



Many vital steel parts in torpedoes depend upon Thomastrip's accuracy to specifications. Thomas has long since been meeting such difficult problems as these. They not only require uniformity, but also demand dependable duplication of its extremely high qualities. Experience in rolling cold rolled strip steel for precision war parts, Thomas not only offers uncoated but also special finishes for intricate production items. Investigate now the possibility of using Thomastrip in one of these finishes to either speed your production or to save non-ferrous metals, or to do both.

Thomas Strip
COLD ROLLED STRIP STEEL

BRIGHT FINISH NOT COATED, SOLDER COATED, ELECTRO-COATED WITH NICKEL, ZINC, COPPER, BRASS

THE THOMAS STEEL CO. · WARREN, OHIO

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That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

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★

Good advertising speeds information from those who have it . . . to those who need it.

McGraw-Hill Publishing Company, Inc.

330 West 42nd Street New York

A NEW TOOL FOR CENTERING ROUND BARS

THE

WHITCOMB QUICKCENTER

IT'S FAST – IT'S EASY – IT'S ACCURATE

Increases shop output
Uses unskilled operators
Saves time and material
Increases shop profits

The Quickcenter is a new shop tool that provides a fast, easy, accurate method of centering round bars for machine work.

It is operated by placing one end of the bar on the vee-block and tightening the handwheel which, by means of right- and left-hand threads of unequal pitch, raises the block and lowers a button until the work is clamped tight. When tight, the center of the bar is in line with the center of the spindle. The lever then advances the center drill into the work.

Because operation involves only the use of a handwheel and lever, the most inexperienced operator can now center work quickly, easily and accurately.

FEATURES

The vee-block is hardened and accurately ground and is fitted with a fine phosphor bronze nut to assure long and accurate life. The button is hardened for wear resistance. The hardened and ground spindle is fitted with grease-sealed, preloaded ball bearings. The spindle is equipped with a Jacobs chuck of ½" capacity and speeds of 700, 1300, and 2300 rpm are available from a three-step vee-belt sheave driven by a ¼ hp 110-volt motor. The Quickcenter is adjusted to center within .005" and it will do in a minute what can take over half an hour on a lathe.

SPECIFICATIONS

Height—49" Length—23" Width—13"
Will center round bars from ½" to 3" diameter
Drill chuck—½" capacity
Speeds—700, 1300, 2300 rpm
Motor—110 v, ¼ hp, 1 ph
Shipping wt. approx. 400 lbs.

PRICE $250 F.O.B. FACTORY

(Price and specifications subject to change without notice.)

WHITCOMB MANUFACTURING COMPANY

TROY, N. Y.

A flexible machine that is the last word in simplicity of operation

HI-SPEED
HONING and LAPPING MACHINE

for use with any standard make honing head

Illustrated is No. 0 Machine equipped for 36" stroke with 80" under the spindle.

HONES CYLINDERS up to 24" in diameter . . . with STROKES from 20" to 72" . . .

IDEAL FOR PRODUCTION JOBS INVOLVING:

Aircraft parts . . . Ordnance parts . . . Diesel engines . . . Compressors . . . Pumps . . . Internal combustion engines . . . Steam cylinders, etc.

Speed up war work involving internal cylindrical surfaces by utilizing a HI-SPEED Honing Machine. When used with proper honing head of any standard make, the HI-SPEED machine produces accurate, straight, round, smooth bores—amazingly fast.

Unique positive stop and dwell system makes it possible to stop the spindle without shock or impact at the bottom of each stroke, at any point within the stroke range and hold the spindle without reciprocation, at that point up to 1½ minutes. Ideal for "blind hole" honing and straight line lapping or honing.

All controls are located at the front of the machine at the operator's station . . . No ladders to climb . . . Stroke setting, hone withdrawal, short stroking at any point, changes in speed of reciprocation or rotation of the spindle made instantly from operator's station.

The HI-SPEED Honing Machine is made in 4 sizes, any one of which can be had with strokes up to 72"...Designed for use with any standard make of honing head.

Tell us your requirements—and our engineers will promptly furnish you with complete information, prices and early delivery dates.

NOTE THESE SPECIFICATIONS:

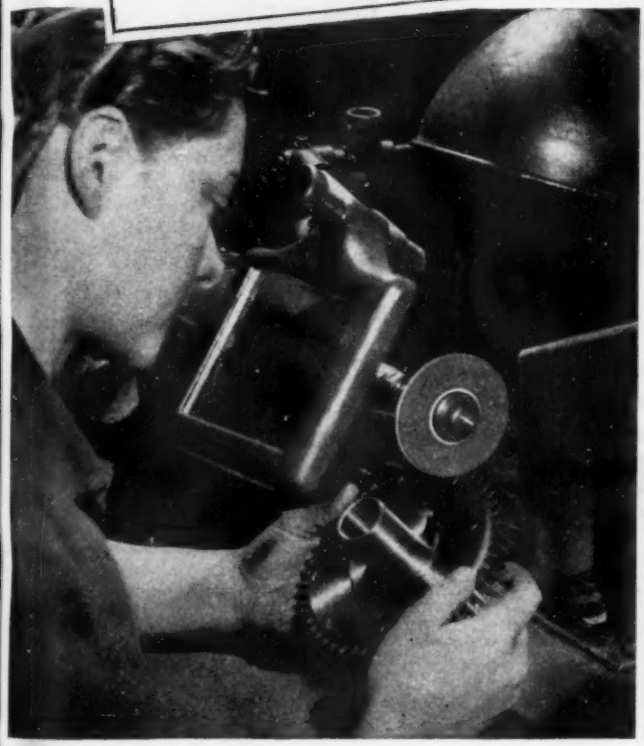
Model No.	No. 0	No. 1	No. 2	No. 3
Stroke (standard)	20"	36"	48"	72"
Working Base Area (standard).. Auxiliary Tables available	21" x 22"	31" x 31"	31" x 31"	48" x 54"
Height Under Spindle Nose (up).. Added Height Available on Order.	48"	60"	75"	100"
Spindle Diameter	2¼"	2⅝"	2½"	2⅝"
Spindle Speeds Through Gear Box	4	4	4	8
Main Drive Motor (standard)	7½ hp	10 hp	15 hp	20 hp
Coolant Pump Volume, Motor Driven	14 gpm	18 gpm	18 gpm	25 gpm
Maximum Bore possible to hone with standard spindle drive motor..	10" Dia	12" Dia	16" Dia.	20" Dia
Maximum Overall Diameter of Cylinder possible to place on standard base	18"	27"	27"	44"
Floor Area	44"x60"	60"x80"	60"x80"	60"x108"
Overall Height	11'6"	15'3"	18'3"	23'8"

ARMY E NAVY

Over our factory flies the ARMY-NAVY "E"—awarded for excellence in the production of machinery and tools vitally needed to win the war.

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Avenue, North Chicago, Illinois

A BIRTHDAY STATEMENT ABOUT "MX" WHEELS



THE announcement of "MX" Wheels in 1942 introduced a new abrasive tool to industry.

These wheels were created by Carborundum to perform a specific function—the removal of "disturbed metal" such as burrs and tool marks, resulting from grinding, machining, boring and similar operations. Research and field tests showed "MX" Wheels could do this job better than ordinary finishing methods. A year's experience has confirmed their advantages.

"MX" Wheels, fabricated from cotton fibre intermingled with abrasive grains are unlike any other abrasive product. They have unique characteristics.

Because of their "cushioning" effect "MX" Wheels literally hug the work. Chatter and vibrations are reduced, smooth finishes assured.

"MX" Wheels are best suited for breaking corners, removing burrs and polishing grooves or slots. For burr removal on jobs where surrounding surfaces must be kept free of abrasive marks . . . or for polishing which must be done with light stock removal to maintain tolerance limitations . . . they are ideal.

A request addressed to us, Dept. AM, at Niagara Falls, will bring you literature further describing the wheel and illustrating a few of its many uses.

CARBORUNDUM
REG. U. S. PAT. OFF.
ABRASIVE PRODUCTS

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company)

BOEING Grind Shear Blades on this ROGERS "NT" GRINDER

One of Many Installations in Leading American Plants Where ACCURACY and DEPENDABILITY are Paramount!

Rogers Knife and Shear Blade Grinders are proving again their *rugged reliability* under war-time pressure schedules. They make you independent of costly delays and *unnecessary wear.*

Rogers Grinders Conserve Knives

Finely adjusted automatic control assures keen cutting edges . . . with *minimum removal of metal.* Reasonable shipments to high priority holders. Write for Circular "N. T."

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197 DUTTON AVE.
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PRECISION QUALITY ROGERS GRINDERS SINCE 1887

UNUSUAL OPPORTUNITIES FOR GRADUATE ENGINEERS!

• Consolidated Vultee Aircraft Corporation plays an important part in the production of all types of aircraft for the United Nations' Fighting Forces. This effort to maintain production must be supported by an adequate supply of manpower. There is a serious shortage of Engineers which may dangerously interfere with this production of airplanes we need.

If you are a graduate engineer and would like to engage in essential war work, there may be a place for you at Consolidated Vultee Aircraft Corporation—a position offering ample opportunity for advancement and increased earnings. Aeronautical experience is not necessary.

If you are a United States citizen not now employed in an essential war industry, agriculture, dairy, poultry, ferrous and nonferrous metal, or lumber industries; or if you have a certificate of availability from the United States Employment Service office or War Manpower Commission of your area; write us today stating your school, degree, age, experience, draft classification, and marital status. We will send you complete information.

We have plants located in California, Texas, Tennessee, Louisiana, Michigan, Pennsylvania, Florida, Arizona, North Carolina, and Kentucky. In the event you are accepted for employment, we will assist in locating housing facilities for you and your family, and will pay your expenses to the place of employment.

This is your opportunity to get into essential war work and, at the same time, a business with a great future. DON'T DELAY! Write us today!

CONSOLIDATED VULTEE AIRCRAFT CORP.

INDUSTRIAL TRAINING DIVISION • SAN DIEGO, CALIFORNIA

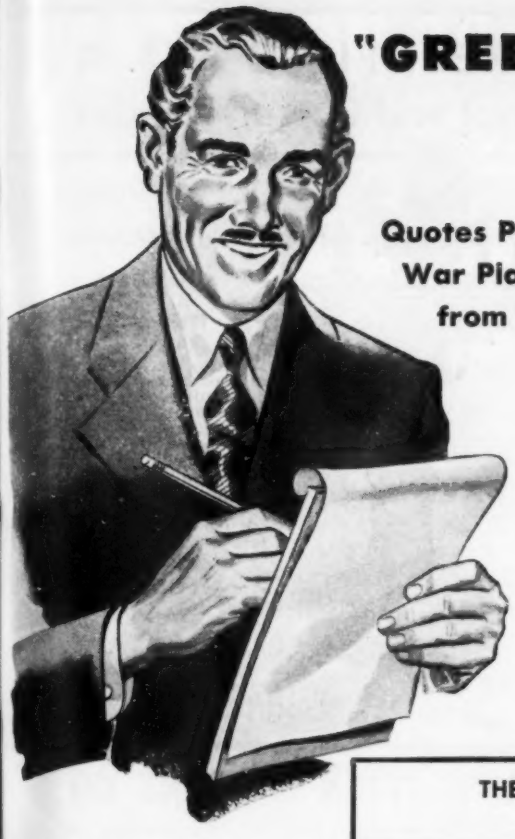
INDISPENSABLE

● Indispensable tools on the war production front—your workers' hands! Shield them from skin infections with **Neo-Film,** the new protective coating. New—in liquid form, **Neo-Film** dries to a *Visible* Glove. Thus you can see with your own eyes how this elastic coating resists the penetration of oils, greases, many chemicals, coolants, solvents, fumes, etc. Priced low to reach many hands. Trials invited under difficult conditions. Use the coupon below. Send for your trial bottle today.

NEO-FILM
"The Visible Glove"
JONES MEDICAL LABORATORIES, INC., CLEVELAND, OHIO
Write Now

JONES MEDICAL LABORATORIES, INC.
880 HURON ROAD • CLEVELAND, OHIO
Please send us a trial bottle of NEO-FILM
Name _____
Company _____
Address _____

"GREEN HANDS FROM SCHOOLS COULDN'T BURN TOOLS"



Quotes POR-OS-WAY'S War Plant Reporter from Interview

Dear Charlie:

I'm at the [redacted] plant where they're using Por-os-way wheels to grind carbide-tipped tools free hand and dry. Even here they've boosted production over 40% and in their own words "green hands from training schools couldn't burn tools." In fact, they said the tools "hardly get warm". Cool action is the big thing in grinding carbide tools.

Be seeing you.

Your roving reporter

"Vic"

THE JOB: Grinding free hand and dry on Excello Tool Grinder carbide-tipped tools 1" x 1" x 6", for turning airplane struts, shaping airplane carburetors, shaping and turning gun turrets for planes.

THE WHEEL: Por-os-way 10" x 2" x 2" C54KV3

All facts and figures given are taken from an actual field survey made by a Por-os-way correspondent

THE RECORD	POR-OS-WAY WHEEL	FORMER WHEEL
Number tools per hour per man	37	26
Number of dressings required	NONE	Every 2 hours
Pieces per wheel	888	520
Stock to be removed	.000"—.250"	same
Wheel life	24 hours	20 hours
Depth of cut	.002"—.010"	Tools burned when jammed into wheel
Number of passes required	12	48
Amount of rejects	0	50 per day (scrapped)
Increase in production	42.3%	

50TH YEAR

WRITE, for complete booklet "Facts About Por-os-way". The address is 430 Wheatland Street, Phoenixville, Pennsylvania.

2 TO 5 TIMES MORE WAR PRODUCTION PER MAN PER MACHINE

POR-OS-WAY*

a new RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.

COPYRIGHT, 1943, A. P. de Sanno & Son, Inc.

FOUND *A New Way to Lower* WHEEL DRESSING COSTS!

TRU-THREAD DIAMOND DRESSING TOOL . . . STEPS UP THREAD GRINDING PRODUCTION

Examine this new TRU-THREAD diamond dressing tool by Wheel Trueing Tool Company, Inc. You'll see the latest development of an organization that has spent 33 years designing, developing and building diamond tools of fine quality.

You'll see a diamond dressing tool that is setting new records of speed and economy—one that can boast production increases as high as 500% and reductions in per piece grinding costs 75%.

How is this possible? Wheel Trueing engineers have found a way of utilizing the hard characteristics of the natural uncut diamond—never before thought possible in tools of this type. The result is a tool that cuts cleaner—obtains forms faster. Forms hold longer. Fewer dressings are required. More work can be ground between dressings. Down time is reduced. And this tool can be made and re-serviced on a production basis, assuring quick deliveries.

DIAMOND TOOLS for

Straight, form, thread and radius dressing, turning, boring, gaging, and core drilling

You'll learn many other advantages of TRU-THREAD TOOLS once you put them to work on your thread grinding machines. *Write or wire for further information today!*

WHEEL TRUEING TOOL COMPANY INCORPORATED

3200 W. DAVISON DETROIT 6, MICH.

GREENFIELD NO. 4 Tool and Cutter Grinder

Write for complete detailed specifications

Swing over table 8½"
Capacity Chuck 4"
Capacity—cylindrical grinding—4"x15"
Capacity—internal grinding—up to 4"

A versatile accurate Machine of many uses

With the variety of attachments available, this machine will handle almost any grinding operation within its capacity. It can be furnished either as a Plain Cutter or Reamer Grinder or as a Universal type (4U) with any or all attachments.

Attachments available include those required for cylindrical and internal grinding. A 4" Universal Scroll Chuck is included in the attachments furnished with the Universal machine.

This machine is ideal for tool room or shop and combines sturdiness with high accuracy. It is well suited to heavy work. Provision is made for convenient handling of straight or taper grinding.

PRODUCTION MACHINE CO.

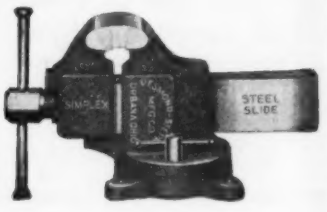
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

DESMOND GRINDING WHEEL DRESSERS & CUTTERS

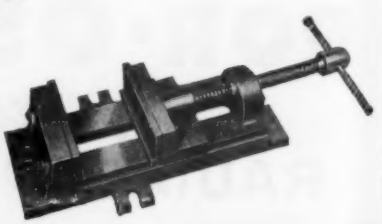
We manufacture a complete line of wheel truing tools and can supply the proper dresser for each of your grinding wheels.

SIMPLEX *Steel Slide* VISES



A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.

Write for copy of catalog "A" and name of your nearest dealer who can supply you.

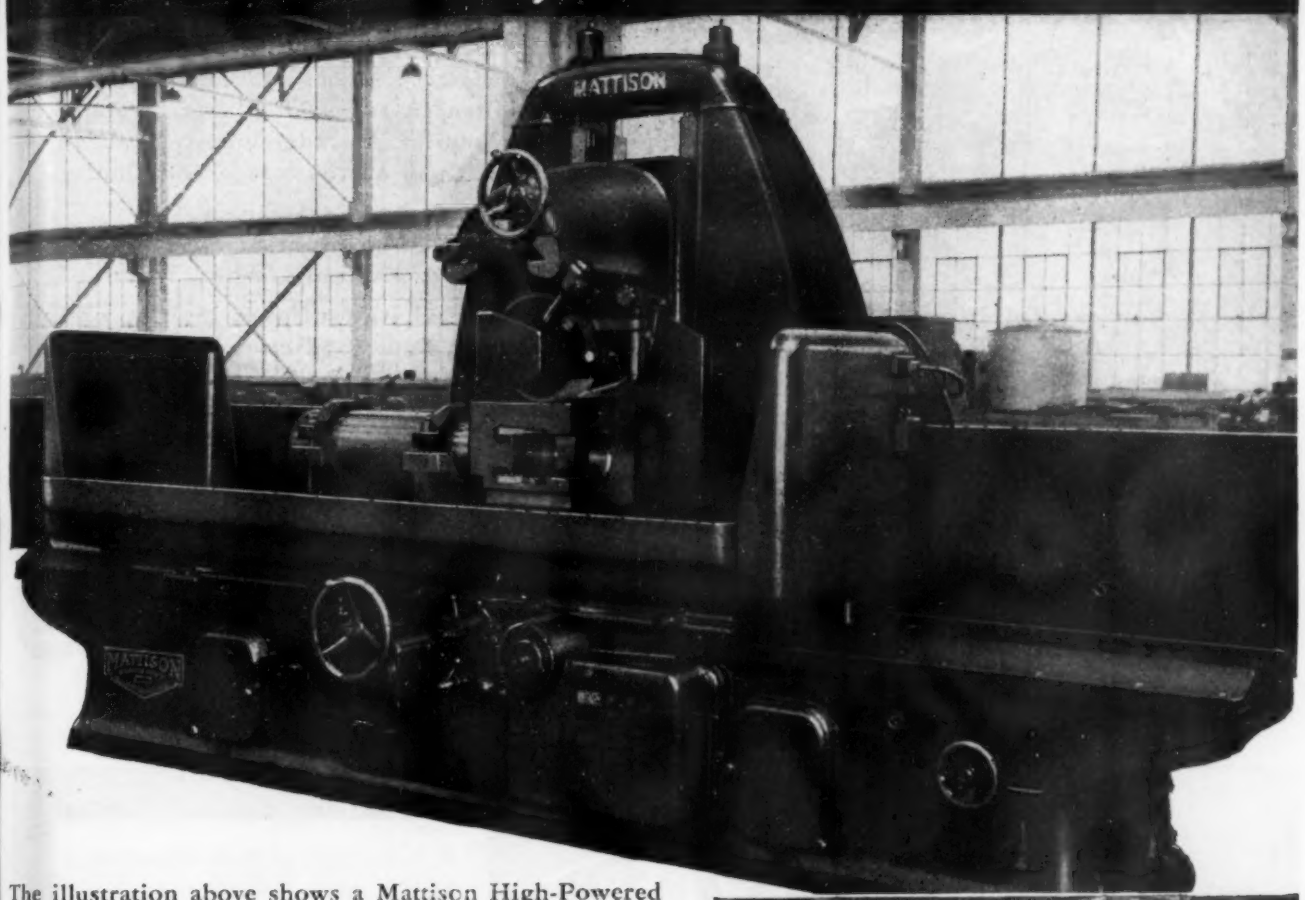


THE DESMOND-STEPHAN MFG. CO.

URBANA, OHIO

MATTISON GRINDERS IN PRODUCTION

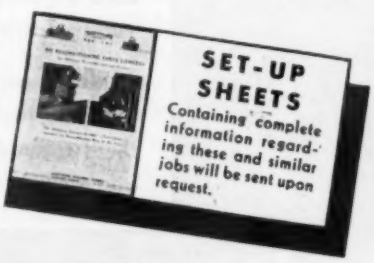
on Breech Rings and Breech Blocks



The illustration above shows a Mattison High-Powered Precision Surface Grinder in production on breech rings for a Canadian war production plant. These rings are ground 5 sides and must be held to close limits and square with the bore.

Breech blocks in illustration to the right are ground four sides. Approximately .015″ is ground off and a tolerance of .002″ is allowed, but they are actually ground to size much closer than that.

Mattison Surface Grinders are constructed to an unusually high degree of accuracy and sturdiness which permit the profitable production of precision work at a high output rate. For further information, regarding the grinding of war jobs, ask us to send you free set-up sheets with complete information.



SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

FOR GENERAL SURFACE GRINDING . . .
THE 846 K-1 WHEEL CAN'T BE BEAT!

Our Technical Engineering staff is comprised of men experienced in particular fields and machine types. Their specialized knowledge is available to you any time or by appointment . . . no obligation.

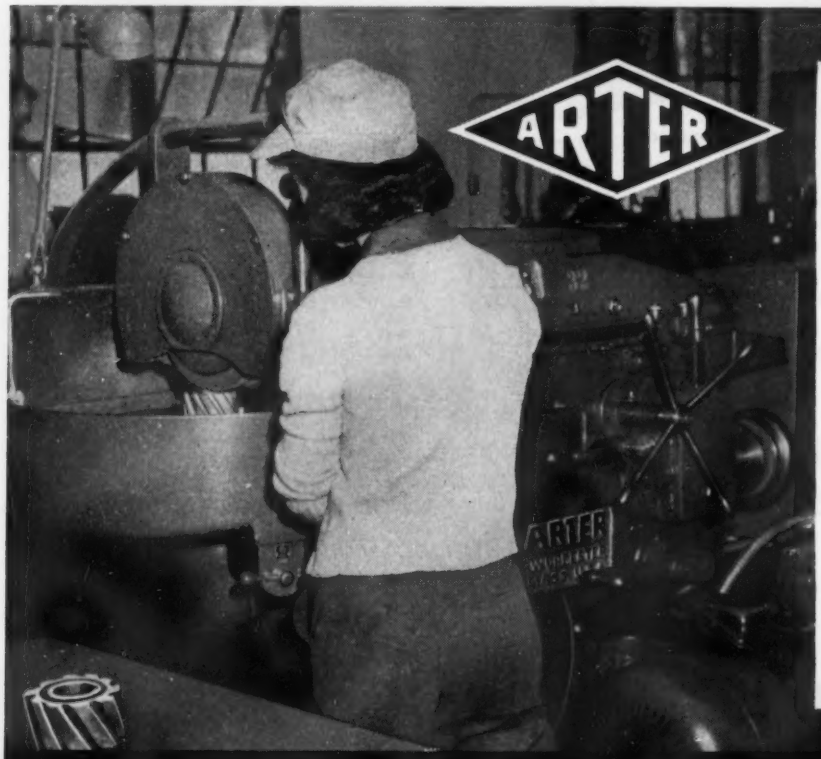
That's the opinion not of one . . . nor a few . . . but of hundreds of production men in scores of plants throughout America. And there's a reason. It's one of those all too rare wheels that give:

1. Excellent Finish
2. Maximum Stock Removal
3. Minimum Wheel Wear

If you have a surface grinding problem, there's a good chance this 846 K-1 Dayton may be just the wheel you are seeking. Made in a wide variety of sizes . . . with shipment from stock in many cases.

SIMONDS WORDEN WHITE CO.
712 NEGLEY PLACE
DAYTON, OHIO

DAYTON GRINDING WHEELS



• In the plant of F. H. Robertson, Malden, Mass., manufacturing cutters and precision tools . . . woman operative grinding cutters on an ARTER ROTARY SURFACE GRINDER . . . one of the many important grinding jobs for this machine. Patriotic women war workers are able to take men's places in this work because of the ease of operation and readily available adjustments provided by this versatile grinder.

Many are the precision grinding jobs that are being done by the happy combination of patriotic women workers and ARTERS.

ARTER GRINDING MACHINE COMPANY
WORCESTER, MASSACHUSETTS • U. S. A.

The Osborn 6-inch Disc-Center Section, harsh of action, fast-cutting—the ideal tool for weld-cleaning.

WELD-CLEANING

—a must on War Work
—a cinch with Osborn Brushes

• Government specifications call for the cleaning of all welds prior to painting or other finishing. Welding scale and slag must be completely removed to prevent corrosion.

In spite of the vast amount of weld-cleaning that must be done, too many are using slow, inefficient hand methods.

This is a job for Osborn power-driven brushes. This is a job for the speed and efficiency of the many Osborn brushes expressly designed for cleaning welds of every kind quicker, better, and at much lower cost.

• Radial and cup brushes for large areas, flat seams, inside angles and curves.

• Special end brushes for corners and inaccessible places.

With welding far more widely used than ever before and weld-cleaning a *must,* speed of cleaning now holds the key to efficiency.

Increase that speed and boost production by cleaning your welds—large and small — with the Osborn brush designed for the job. There's an Osborn representative near you who will gladly show you how Osborn Brushes can step up *your* output. Write *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland, Ohio.*

WORLD'S LARGEST MANUFACTURER

OF BRUSHES FOR INDUSTRY

Osborn Brushes

WRIGHT
Improved High Speed
HOISTS

Buy your load chain a drink!

Believe it or not, mister, a well-lubricated load chain will outlast a dry chain **fifteen times.** That sounds incredible, but it's true. You see, every link has a bearing area where it meets its neighboring links. Unless there is a protecting film of oil at these points, the friction will cause undue wear. Another place where the protection of oil is needed is when the chain comes in contact with the load wheel.

... But let's go back to the chain itself. A dry chain wears prematurely —lengthens itself out of pitch. And a chain out of pitch cannot seat itself properly in the wheel sockets. Another vicious result of wear.

... So please—now that all steel products are critical—lubricate your load chain regularly and make it last; twice, five times, ten times, yes—**fifteen times** as long.

Send today for a free copy of the Wright Crane Signal Chart. This chart (36" x 24") can be tacked up on the bulletin board to teach the men standard crane signals which will speed operation and promote safety.

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York

AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT, CONNECTICUT

In Business for Your Safety

ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

CRITERION *Diamond* TOOLS

For **STEADY PRODUCTION**

Dependable diamond tools are vital in present production schedules. Every day more users are turning to Criterion Diamond Tools for the kind of service which they must have. Quality of diamonds used plus a unique method of setting assures extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Order direct. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

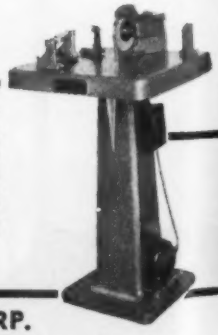
HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

CUTTER LIFE EXTENDED 5 to 8 TIMES
with the
BARNES *PRECISION* CUTTER GRINDER



Highly efficient for grinding formed cutters, gangs of form or plain cutters, plain cutters, shank cutters, plain or tapered reamers; makes possible the use of profile ground formed cutters. No need to change existing cutter equipment. Form relieved cutters, sharpened on the "Barnes" become profile cutters. Quality and quantity of work produced greatly increased. Accuracy absolutely assured.

SEND FOR DESCRIPTIVE CIRCULAR

GENERAL MACHINERY CORP.
140 Federal St. Boston, Mass.

No. 34 ABRASIVE SURFACE GRINDER

with the

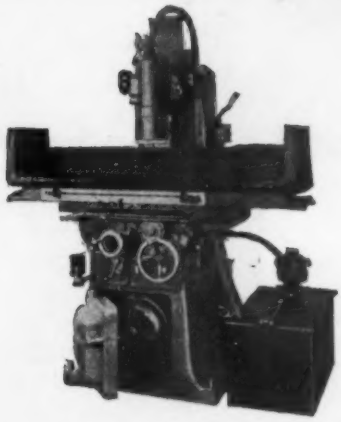
VERTICAL SPINDLE

that works for

VICTORY

ON many a production line, the ABRASIVE No. 34 is grinding out small parts that are unusually accurate, smooth and flat. The vertical spindle, and cylinder type wheel, speed output and cut costs in producing such work as small flat dies, washers, punches, spacers, parallels, chasers and raising blocks. Engineered and built to ABRASIVE'S high standards, the No. 34 offers many important features including the one-piece bed casting, as originated by this Company.

Ask your nearest dealer for information concerning this and other ABRASIVE Grinders—or write the factory direct.



ARMY E NAVY

ABRASIVE MACHINE TOOL CO.

Dealers in Principal Cities

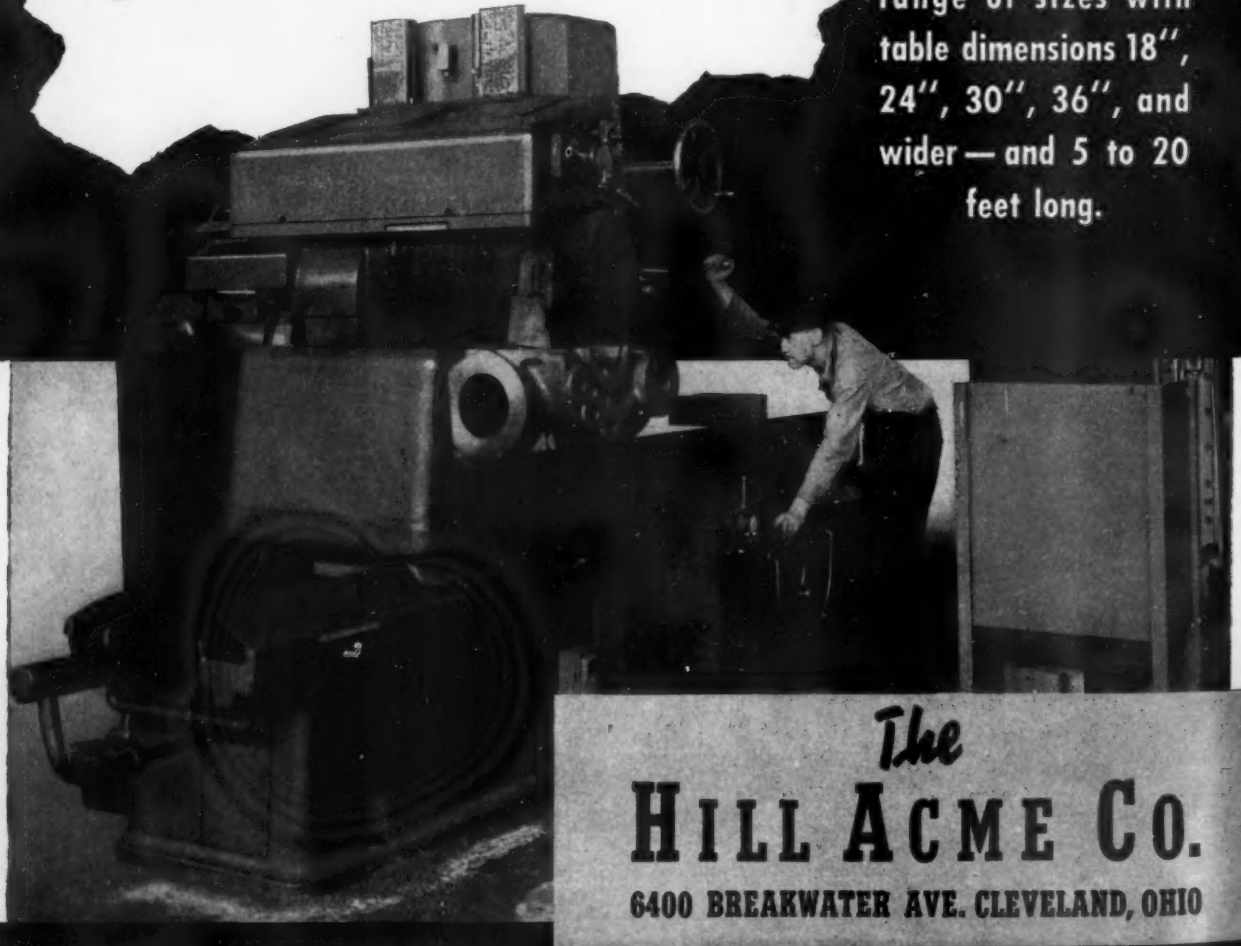
EAST PROVIDENCE · · RHODE ISLAND

After June 1, 1943 our New England and Metropolitan New York representative will be RUDEL MACHINERY CO. with offices in New York City, West Hartford, Conn., and Boston, Mass.

This letter will interest YOU!

"Regarding the type of work done on this grinder, we wish to advise that we are using it for a multitude of purposes. The main usage is in grinding the steam-tight joints on the lower and upper halves of turbine cases. This joint is a precision joint and must be ground accurately to assure steam tightness. We also use the grinder for the grinding of covering plates for oil reservoirs and other places where a smooth precision joint is needed to assure a gas or liquid tightness."

HILL Hydraulic Surface Grinders are built in both Horizontal Spindle and Vertical Spindle types in a full range of sizes with table dimensions 18", 24", 30", 36", and wider — and 5 to 20 feet long.



The HILL ACME CO.

6400 BREAKWATER AVE. CLEVELAND, OHIO

Announcing

The New 277

Safety Grinding Wheel

for

Centerless and Cylindrical Jobs,

especially adapted

for

National Emergency Steels

The new bond used in No. 277 wheel is the product of Safety's Engineering Research staff. This new bond is one of our staff's outstanding contributions to the war effort.

SAFETY

The new No. 277 wheel is available in practically any size, shape, grit, porosity and grade of hardness. We will be pleased to quote on your requirements. Write us today.

THE SAFETY GRINDING WHEEL AND MACHINE COMPANY

SPRINGFIELD, OHIO — SALES OFFICES IN PRINCIPAL CITIES — ESTABLISHED IN 1892

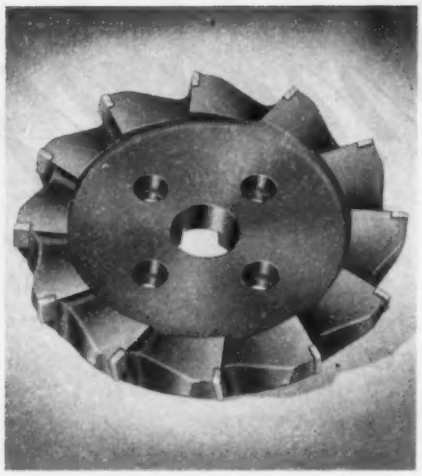
MANUFACTURERS OF SAFETY MOTOR DRIVEN PORTABLE GRINDERS, SAFETY RITE-SPEED GRINDERS, GRINDING WHEELS FOR EVERY PURPOSE, INCLUDING THE FAMOUS "SAFETY GRIP-LOK GRINDING WHEELS"

NEW!

STANDARD and SPECIAL CARBIDE TIPPED

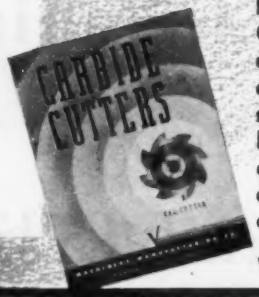
Cal-Cutters

FOR HIGH PRODUCTION MILLING!



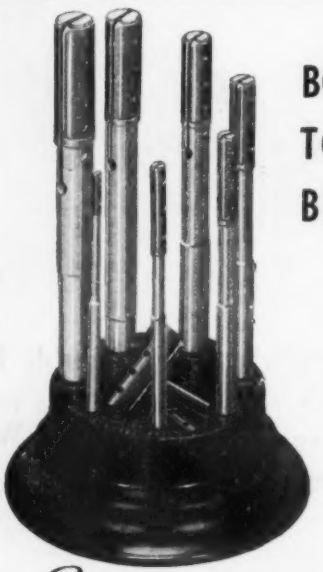
Hyper-mill "Cal-Cutter" with negative rake for machining steel

Specially designed with suitable rake and helix angles for high production milling of steel, cast iron, aluminum, bronze, etc. Standard types of Cal-Cutters with negative or positive rake angles include: Staggered tooth mills, end mills, shell end mills, face mills, hyper mills, heavy duty face mills, adjustable bore-face mills, half side mills, adjustable face and step mills, slitting saws, etc. Special cutters (not listed) made on order.



Write for new catalog A-1—no obligation!

MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST., VERNON -- LOS ANGELES, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS



BOYAR-SCHULTZ TOOL MAKERS BENCH LAP SET

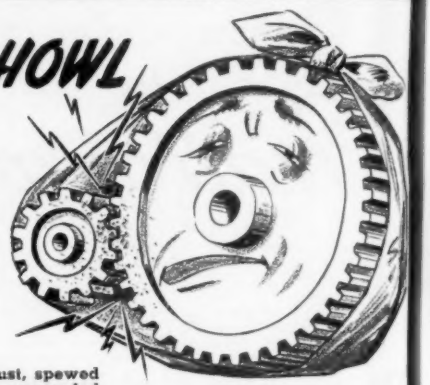
$7.50 COMPLETE

SEVEN sizes most commonly used in Tool and Die work are selected to make this convenient Lap Set. Tool and Die Makers find that it saves time. Complete Set consists of one Copper Head Lap each and two extra Sleeves of the following sizes: ⅛"—3/16"—¼"—5/16"—⅜"—7/16"—½" — convenient Die Cast Base—One Can of Copper Head Lapping Compound.

Shipped from Stock

BOYAR-SCHULTZ CORPORATION
2109-H Walnut Street CHICAGO, ILLINOIS

YOU'D HOWL TOO...



WITH GRIT IN YOUR TEETH

Abrasive grit and dust, spewed from the wheels of unguarded grinders and buffers, can turn the purr of finely honed gears on your expensive shop machinery into a discordant howl that the best lubricants won't silence.

Sure, we know that nobody expects a tool room to sound like a symphony concert, but when gears begin to clatter and bearing surfaces lose their smoothness, production takes a nosedive.

End the assault of grit and dust on precision manufacture by installing the Cincinnati Air Master on your grinders and buffers, trapping trouble at its source. The Air Master comes in three sizes to fit all grinding and buffing machines. Write for complete information.

The Cincinnati
ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS
The Cincinnati Electrical Tool Co. 2676 MADISON RD.
DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

HOW PROCESS ENGINEERS SAVE TIME IN MACHINING MISCELLANEOUS HOLES!

Operator merely loads part and controls entire machining of nine holes by push button control. See data below on tooling and operations.

9 Spindle Unit-Type Machine Saves 39.21 Minutes in Drilling Airplane Engine Part

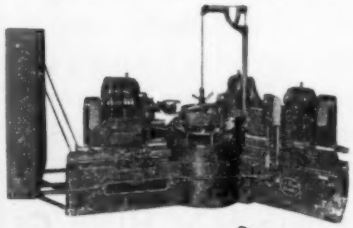
When process engineers, and others responsible for laying out production lines, are called upon to increase production over that obtained from standard single spindle machines they specify multiple spindle unit-type machines for picking up the odd holes. This is the best method and equipment available for doing this difficult job.

On this particular machine (one of many W. F. and John Barnes Unit-Type machines installed in this plant) the machining time alone was cut from 42.31 minutes to 3.10 minutes. Additional savings were obtained in handling-time since nine spindles work simultaneously in place of one at a time. The operations covered are listed in detail in the column at the right.

"Special" Machine Production with Standard Machine Flexibility

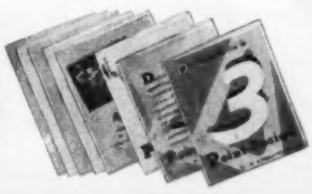
This, like other W. F. and John Barnes production machines are built from *standard* hydraulic feed and drive units. These can be mounted in any position and readily changed from one to another to meet any reasonable change in design of the part being machined. Many, now in use on war production, can be converted to peace time product manufacturing at the end of the war.

Perhaps you can save time and man-power by using these machines in your work. It isn't necessary to have unusually high production requirements to obtain the advantages of unit-type machines. Many have been furnished with interchangeable quick-change tool heads for machining different parts in moderate lot sizes. Let one of our engineers assist you in your selection of equipment for faster boring, milling, drilling, tapping, reaming and honing operations. Their experience in designing and building special machine tools for high production methods may help you with your war work. Call on them without obligation.

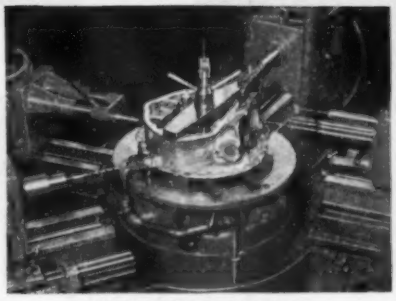


MORE PRODUCTION AND TOOLING IDEAS

Free set of eight bulletins describing a better way to get better machines. Each bulletin traces a machining problem from the original study of the part to the final machine design. Each may suggest a more productive tooling set-up that you can use today — valuable file information for tomorrow. Write for Bulletins 743.

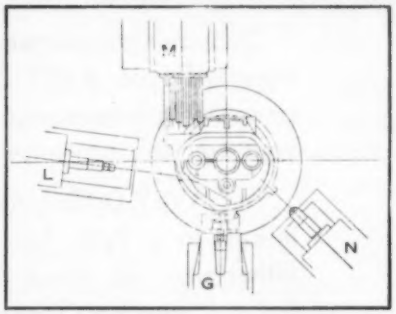


W. F. & JOHN BARNES



Crankcase Intermediate Rear for Radial Airplane Engine.

PART TOOLING AND OPERATIONS



Schematic diagram (plan view) of tooling used on four way unit-type machine. Operations performed by each unit are listed below:

No. of Spindles — 9.

UNIT L.— Drill 21/64 diameter.

UNIT M.— One 21/64" Drill.
One 11/32" Drill.
Four drills for 5/16—18 tap.

UNIT N.—One 9/16" Drill.

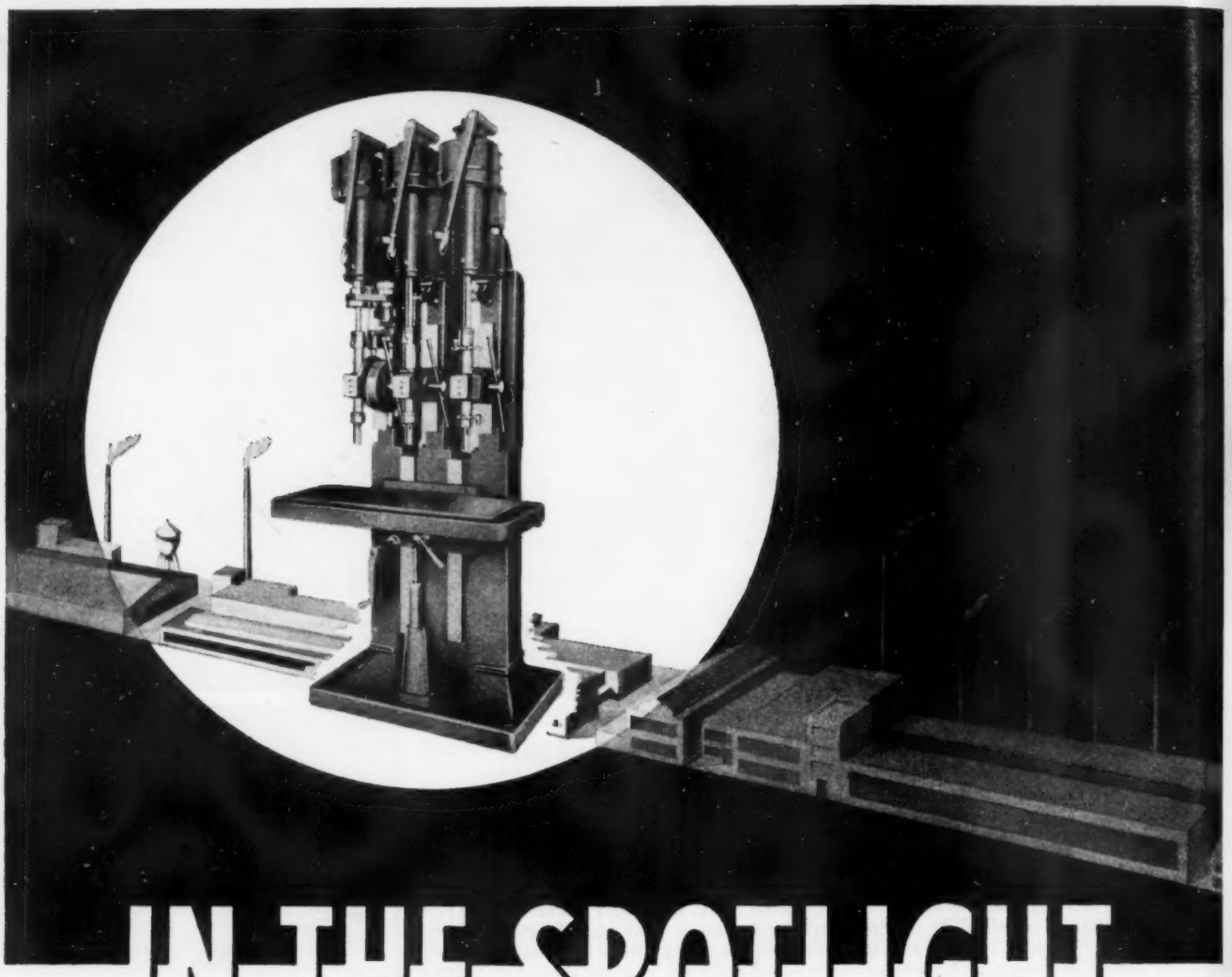
UNIT G.— One 9/32" Drill.

Type of cutting material — H.S.S.

ACCURACIES —
Diameters + .003" − .004'
Locations ± .010"
Angular Locations ± 1.0'

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.



IN THE SPOTLIGHT

Occupying a prominent place on the production line of American Industries is the standard type AVEY Drilling Machine. Sturdily built to give longer operating hours, smoother performance and lower maintenance. A wise investment because it does your war job now—your peace job later, with no time out for conversion.

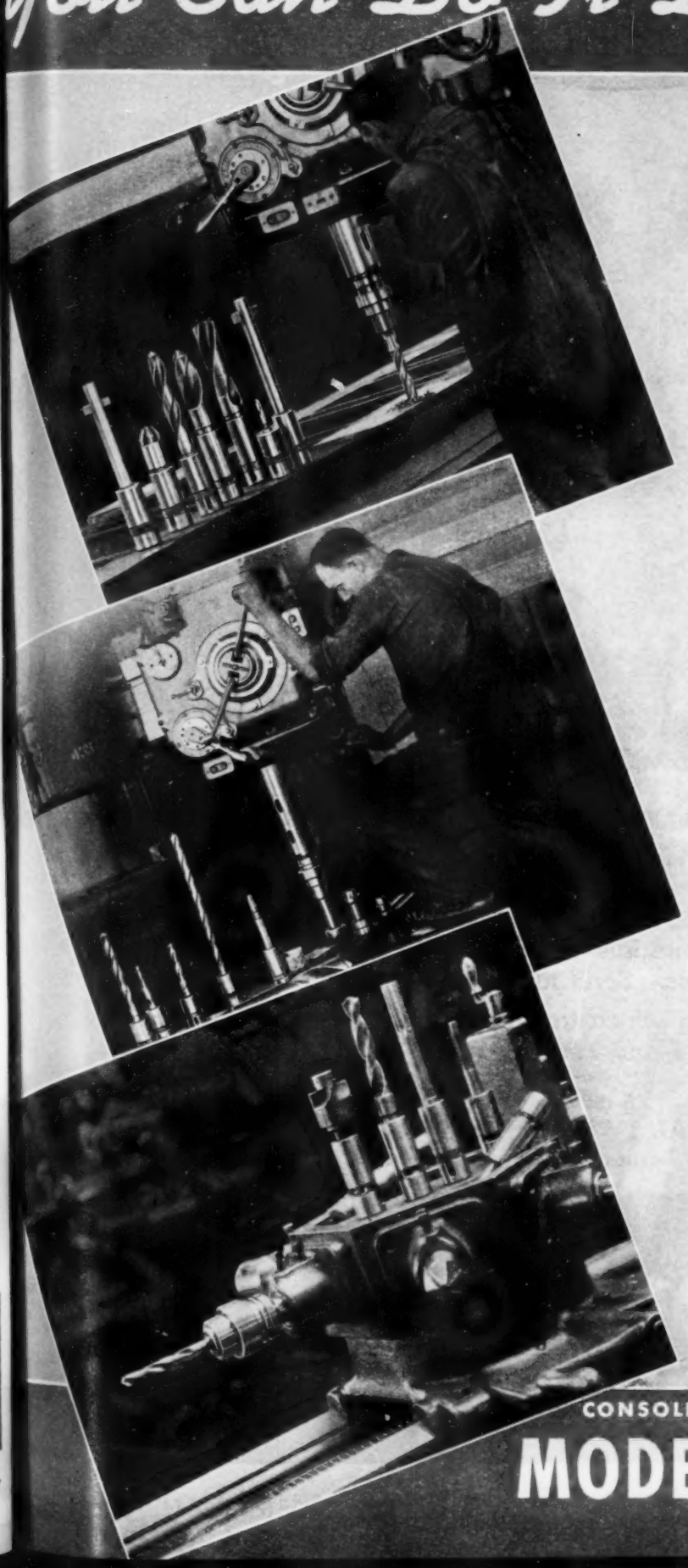
This AVEY Drilling Machine, Type MA-6, is now being built in No. 2 size (capacity in cast iron, 7/8"). No. 3 size (capacity in cast iron, 1 1/4"). One to six spindle units, either size. Six speed machine, two speed motor with three mechanical changes through gearing. Speed range is eight to one. Push button control. The above photograph shows the MA-6 equipped with three spindles, the Aveymatic Feed, Hand Feed and Tapper.

AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO, U. S. A.

CINCINNATI · OHIO

Avey DRILLING MACHINES

If It's Drill-Press Work, You Can Do It Quicker with



MODERN-MAGIC

QUICK-CHANGE CHUCK & COLLET EQUIPMENT

Shops that are striving to make or break production records have learned to depend upon Modern-Magic Quick-Change Chuck and Collet Equipment. The time saved by these efficient tools means real dollars-and-cents to any shop man for they reduce the idle time of revolving spindles to practically zero! Consider the fact that Modern-Magic Chucks enable tools to be changed while the machine is running—without stopping or even slowing down the spindle—and you can begin to realize just how important these chucks are to any shop on a war-time production schedule.

Modern-Magic Chuck and Collet Equipment accepts all tools. Thus a sequence of operations such as boring, counter-boring, drilling, reaming, tapping, etc., can be performed practically continuously.

You'll find Modern-Magic equipment equally valuable on your Turret Lathes where there are not enough stations to accommodate the tools necessary for a particular job. Required tools may be inserted and removed one after the other, in effect adding extra stations. This equipment can also be readily adapted for use with other machines.

If you have a production problem, it's a safe bet that Modern-Magic Chucks and Collets can help you solve it. For more complete information, send for Bulletin M-101.

CONSOLIDATED MACHINE TOOL CORPORATION

MODERN TOOL WORKS

DIVISION

ROCHESTER, NEW YORK

For Tapping brass, bronze, aluminum, plastics, cast iron or steel—the wide range of Winter Brothers precision-built taps will insure top production results — rapidly and accurately.

The Winter Tap Data booklet offers some practical suggestions in selecting the proper taps to use in these materials—and THE RIGHT TAP IS IMPORTANT in producing smooth-finish threads. Send for your copy today.

Always specify the material in which taps are to be used, so we can help you do your thread cutting quicker and better.

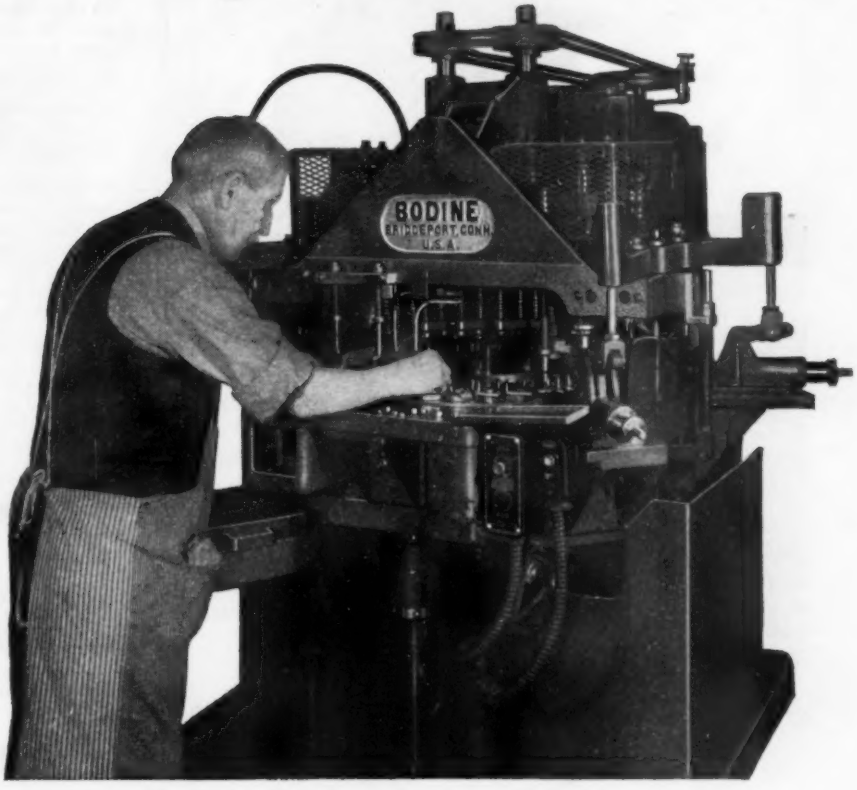
A division of
THE NATIONAL TWIST DRILL & TOOL CO.
Rochester, Michigan

Winter Brothers

COMPANY Wrentham, Massachusetts, U.S.A.

"ROUGH RIDER" IN '98...

SMOOTH OPERATOR IN '43!



The soldier who FOUGHT under Teddy Roosevelt at San Juan Hill in 1898 can now PRODUCE under Franklin D. Roosevelt in 1943.

And many of them are doing it . . . with the help of automatic production machines such as the BODINE.

This Multiple Spindle DRILLING, MILLING, TAPPING and SCREW INSERTING Machine has been designed for high speed production, and because of its automatic indexing dial, easy feeding, and safety features, operators can be quickly trained to maintain a steady flow of small armament components.

Up to eight tools may be set up to operate vertically, horizontally, diagonally, or from an inverted position — one or all planes *simultaneously*, and all of the FOUR operations, if desired, during one cycle of the dial.

The operator merely places the work in a clamp and the various tools operate at successive stations as the dial is automatically indexed to position. Ejection is usually manual,

DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

but on certain small parts it may be automatic. Hopper feeds are also practical on some jobs. Automatic safety devices protect machine and tools; assure safety to operator.

There are six sizes of Bodine machines with capacities for drilling and tapping up to ½" dia. and up to 3½" in depth.

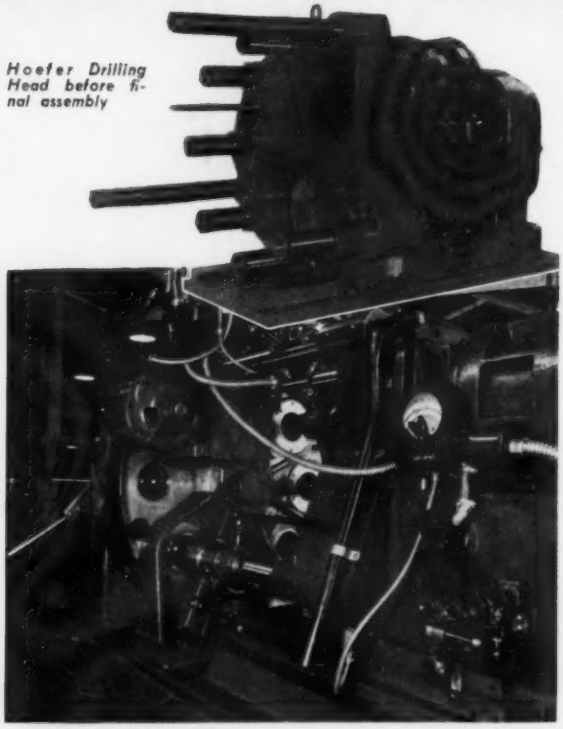
An added feature is the compact design. Even the largest size, which mounts 8 tools, requires but 90" x 96" floor space.

Send for Bodine's new bulletin which illustrates and describes these machines in detail.

THE
Bodine
CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

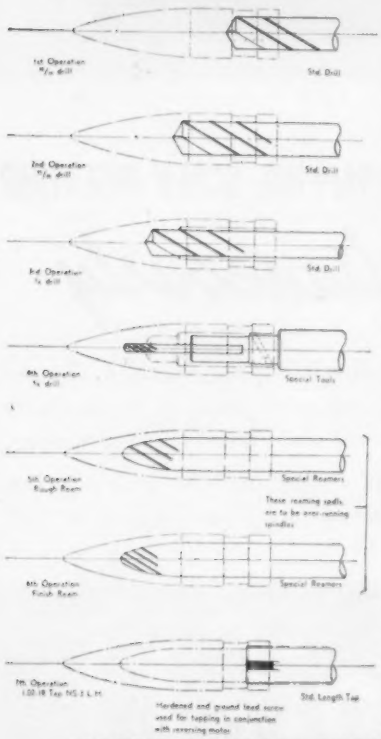
HOEFER MACHINING HEADS
Provide High Production Method for SHELL MAKING



Hoefer Drilling Head before final assembly

Photo of complete machine showing Hoefer Head at right

TYPICAL TOOLING FOR 37 M.M. AIRCRAFT SHELL



● 37 m. m. anti-aircraft high explosives shells were produced with a Hoefer 15 h. p. unit. A six spindle head was used in connection with an 8 station automatically indexing trunnion, holding 8 pieces, and a single spindle automatically reversing (hardened and ground) lead screw tapping unit. All these were electrically interlocked with a central control station controlling both electrical and hydraulic circuits.

Any such operations ordinarily considered for a multiple turret type machine can be most successfully handled by drilling units in multiple head and electrically indexing fixtures as the above equipment demonstrates.

Confer with us on your problem.

HOEFER'S WHOLE BUSINESS IS HOLES

HOEFER MFG. CO. *Freeport, Ill.*

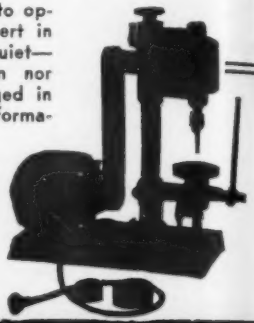
For Sensitive Tapping of Precision Work

HAMILTON-MUEHLMATT
SENSITIVE TAPPING MACHINE

● Here's a high speed, sturdy little tapping machine which is especially adapted to precision tapping of light work. It is now being used very successfully for tapping parts for instruments, cameras, watches, clocks and business machines.

It has gained wide acceptance due to the high quality of work produced because of its particularly smooth operation without breakage of even the finest taps.

Mechanically simple and easy to operate, a man can become expert in an hour or so of operation. Quiet—no noisy reversing mechanism nor slinging of oil. Can be plugged in any light socket. For full information write for bulletin.



PERTINENT DATA

Capacity—From smallest and finest tap to 10-32 inclusive
Power—¼ H.P. 1750 R.P.M. Motor either CI-AC or compound DC
Tapping speeds approx 1200 to 2600 R.P.M.
Size of machine—16 in. x 7 in. x 22 in. high
Weight—Approx. 60 pounds

The Hamilton Tool Co.

830 NINTH ST HAMILTON, OHIO

Prompt ANSWERS
to your business problems

MISCELLANEOUS business problems are daily being solved quickly and easily, by use of the Searchlight Section of this and other McGraw-Hill publications.

The Searchlight Section is classified advertising; you can use it at small cost, to announce all kinds of business wants of interest to other men in the fields served by these publications. It has long been the regular meeting place of the man with business needs and the men who can fill those needs.

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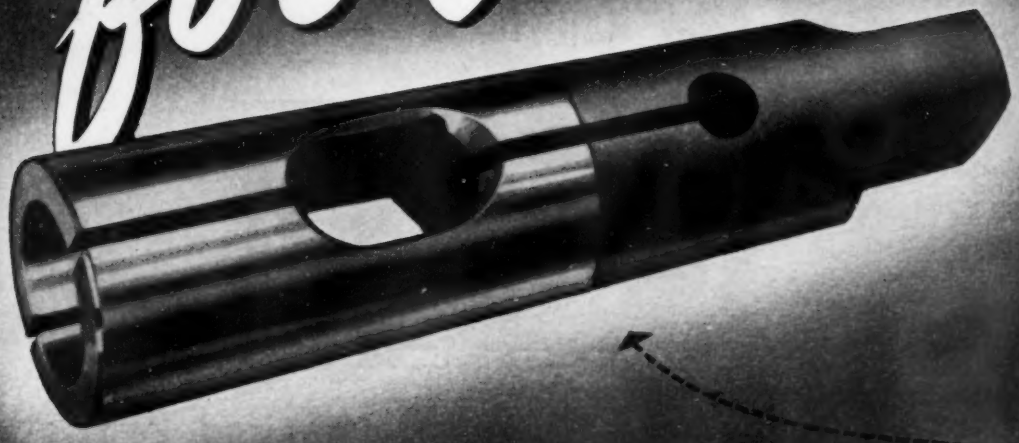
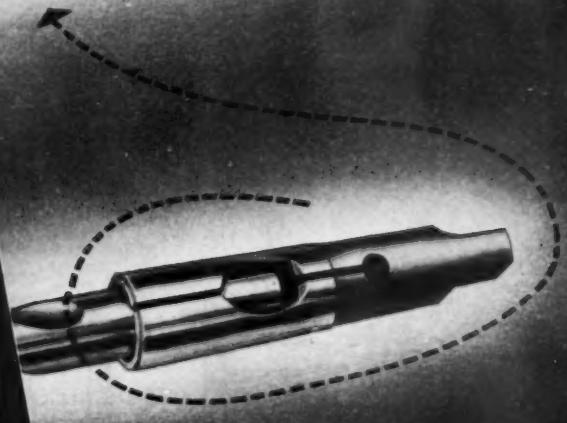
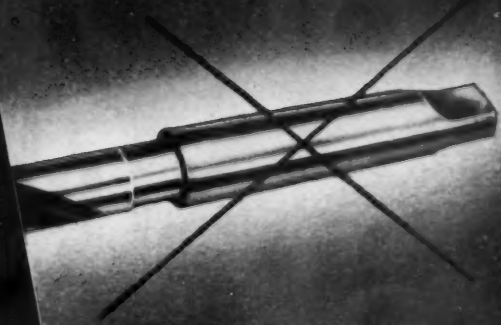
Conserve for Victory







By Using

your straight shank drills in taper hole spindles. The Scully-Jones Style "B" Drill Chuck has a taper shank to fit the spindle and a straight bore to accommodate the straight drill. At the bottom of this hole is a splined section having a width that permits a milled flat on the drill to enter and furnish a positive drive. The inside hole and the taper on the outside are ground concentric, thus assuring a true running drill.

IMMEDIATE DELIVERY

Scully-Jones
AND COMPANY

1901 SOUTH ROCKWELL STREET * CHICAGO, U. S. A.

Quality
THE NICHOLS MILLER
Offers SPEED with Tool Room ACCURACY
Modern precision construction and remarkable adaptability make the Nichols a natural choice for dependable performance.
Insets illustrate FLEXIBILITY. Upper view shows Profile-milling cam slot using template and follower. Lower view is typical horizontal setup, milling clutch teeth using simple indexing fixture.
Moderate price.
Ask for full details!
W. H. NICHOLS & SONS
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CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

War-Learned Proficiency
Ready for Post War Production

A.C.E. SPECIAL CUTTING TOOLS

We are busy—very busy turning out special cutting tools of many types and sizes for a host of defense plants.

But when peace comes you will find us just as ready to tackle your post war tooling problems with new methods we have learned for better, faster work.

Send us your immediate needs for prompt estimates.

Certain attractive territories open for active agents.

AMERICAN CUTTER & ENGINEERING CORP.
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AMERICAN CUTTER
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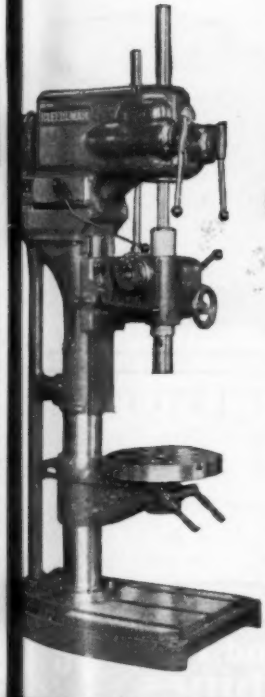
SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

Cleereman

Unit Construction assures Sustained Precision



Speed and feed transmissions in all CLEEREMAN Machines are of unit construction to assure not only smooth flow of power, but also to assure sustained precision throughout the long life of each machine. Features of these unit designs are—hardened sliding gears; precision ground teeth; Gleason cut and lapped spiral bevel gears; horizontal, multi-splined shafts; and, precision ball bearings.

WRITE FOR CATALOGS!

DRILLING MACHINES
Catalog No. 400, just off the press, describes in detail construction and uses of CLEEREMAN Drilling Machines.

JIG BORERS
Catalog No. 300, newly off the press, gives full details about CLEEREMAN Jig Borers and Accessories.

ARMY E NAVY

BRYANT MACHINERY & ENGINEERING COMPANY

Associated with **CLEEREMAN MACHINE TOOL COMPANY**

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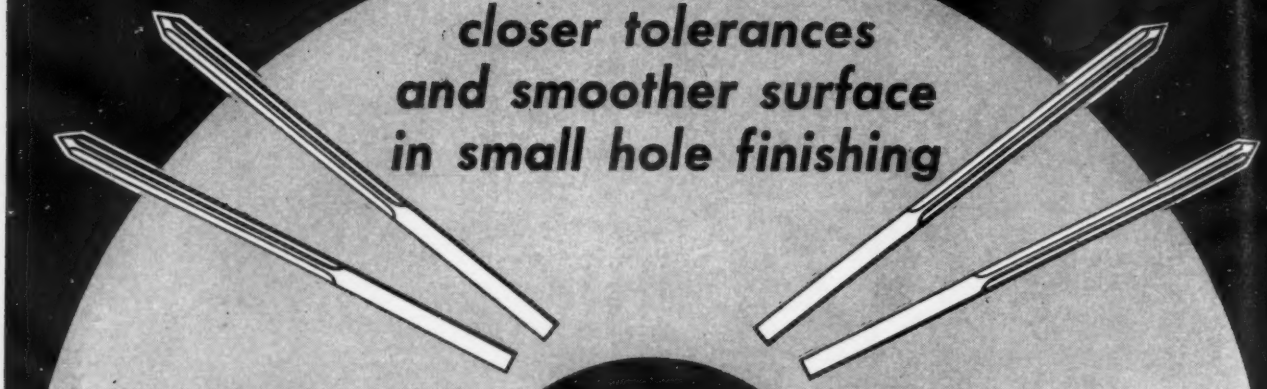
L & I SMALL HI-SPEED REAMERS with Ground Flutes

for closer tolerances and smoother surface in small hole finishing



Designed by specialists in small hole production, L & I Reamers are particularly recommended for extremely close tolerance work and where smooth finish is also essential.

L & I Reamers are produced from centerless ground, high-speed steel stock with flutes *ground in* after hardening and carefully *lapped*—a process which eliminates distortion of flute structure frequently resulting from the heat-treating of small diameter milled-flute reamers.

These long-lived, keener cutting tools are available for prompt delivery in standard sizes from 1/16" to 1/4" diameter as well as in special dimensions.

Send for Descriptive Circular, giving specifications and prices.

LAVALLEE & IDE, INC., CHICOPEE, MASS.

ERICKSON *Precision*
COLLET CHUCKS

One Erickson Collet Replaces 7 Single Purpose Collets.

Above: Special Model 202 chuck used in Aircraft Industry

SEND FOR BULLETIN "D"

ERICKSON STEEL CO.
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ASSURE BETTER PRODUCTS WITH THE INSPECTOGRAPH

The Inspectograph does two things:—

1. The large four inch lens magnifies the inspected object to double its size and provides a wide field of vision for both eyes without eyestrain.
2. The two fluorescent tubes project a strong, shadowless light of 300 feet candle power directly on the work being inspected.

Quickly exposes faulty or torn threads, cracks, burrs, scratches, etc., not apparent to the naked eye.

PRICE $35.00

S. LOWE & SONS CO.
20 Sanford St. Fairfield, Conn.

LUCAS "PRECISION"
Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

LELAND-GIFFORD COMPANY · MACHINE TOOLS · CRANK SHAFTS · WORCESTER MASS. U.S.A.

Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD CO.
WORCESTER, MASS.

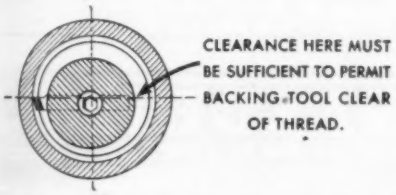
HOW AND WHY

WILLIAMS' TOOLS AID WAR PRODUCTION

INTERNAL THREADING WITH WILLIAMS' BORING TOOLS

● Internal Threading on an engine lathe involves practically the same operations as external threading (described in last month's Data Sheet No. 14) except for the tool used and its application to the work. Three types of Williams' Boring Tools are used extensively for internal threading. Instructions for the use of the three types illustrated are identical, and represent our recommended practice.

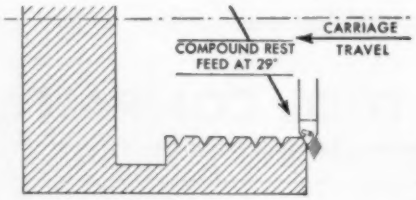
Since threading cutters are not regularly furnished with Williams' Boring Tools, the first essential is to provide a cutter bit ground to the proper angle, 60° for American National Threads. For internal threading more front clearance is required to prevent the heel of the tool from rubbing than is required for external threading.



The top of the cutter bit should be set at exact center as shown above, and a bar of the largest practical diameter used in order to provide maximum rigidity. For right hand threading, the Compound Rest is rotated counter-clockwise (feed crank swung to right) and accurately set at 29°. Now mount the tool so that the bar is parallel to the lathe centers and align the cutter bit accurately with a center gage with the point of the bit to the wall nearest the operator.

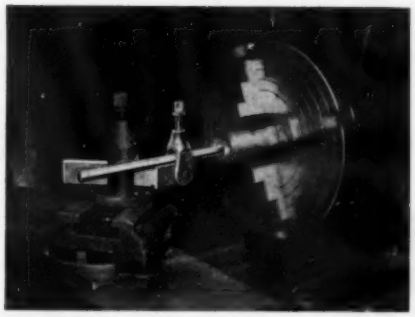
With the work chucked or held on a face plate, right hand threading is done from the outer edge of the bore *toward* the headstock. Left hand threading is done from left to right, with the lead screw direction reversed.

Using the Compound Rest Screw (not the Carriage Cross Feed) feed into the work .002″ to .004″. Repeat until desired depth is attained, finishing off with depth of cut reduced to .001″ on the final pass.



Action of the Thread Cutting Tool, with Compound Rest set at angle of 29°, is illustrated above. Left side of Tool removes main chip which curls clear better than when Tool is fed in at 90° angle. Right side of Tool merely shaves the thread smooth and helps produce a good finish.

WILLIAMS' LIGHT BORING-TOOL HOLDER



Made in 3 sizes for bars 1/8″ to 7/16″ diameter, and square cutters 1/4″ to 3/8″ square.

WILLIAMS' BORING-TOOL HOLDER

Furnished with Sleeve or Plain bar; Plain bar illustrated.
Made in 5 sizes for bars 3/16″ to 1-1/8″. Each takes many sizes of bars.

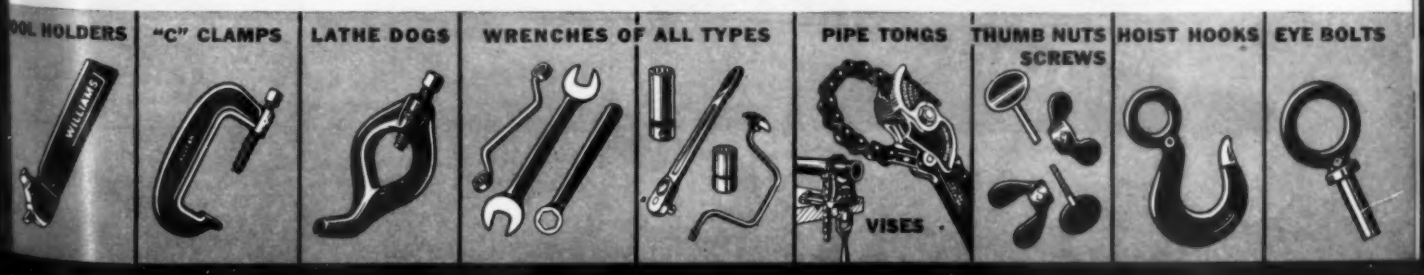
WILLIAMS' ADJUSTABLE BORING-TOOL POST

Made in 4 sizes for bars 1/2″ to 2-1/4″. Height of bar easily adjusted with knurled ring.

Williams' Boring Bars, and Cutters, Plain and Sleeve type, are also sold separately. 9 sizes, 1/2″ x 7-5/8″ to 2-1/4″ x 34″.

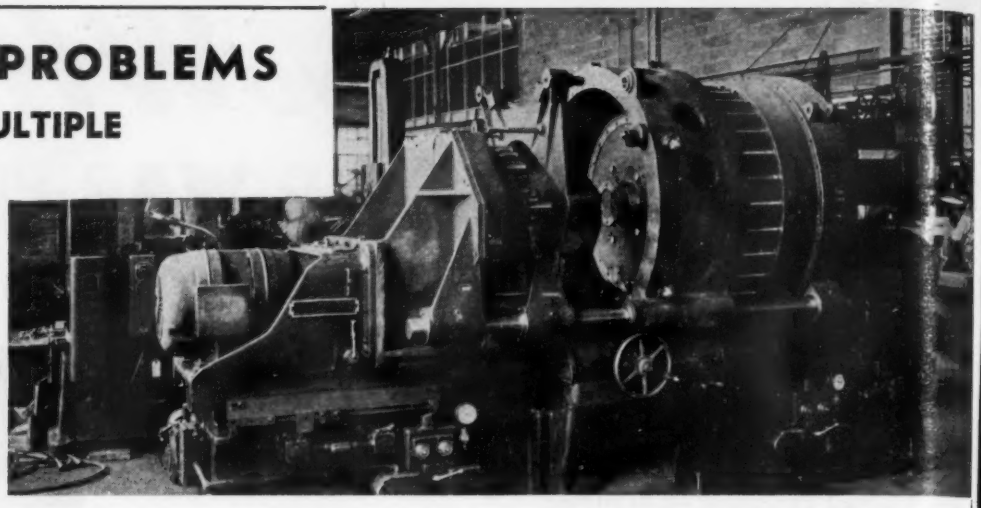
WILLIAMS
SUPERIOR DROP-FORGED TOOLS
Headquarters
for over half a century for
DROP-FORGINGS and DROP-FORGED TOOLS

Sold by Leading Industrial Distributors Everywhere . . . J. H. Williams & Co., Buffalo, N. Y.



SOLVING PROBLEMS INVOLVING MULTIPLE SPINDLE OPERATIONS A Buhr SPECIALTY

Note This One



Tooling consists of a fixture for clamping an anti-aircraft part of which one side is a bushing plate. Right hand head has 82-spindles, and Left hand head has 38 spindles with a sliding bushing plate for removal of part from fixture.

All spindles have vertical adjustment for drill adjustment. An oil pump is provided in each head to insure positive lubrication to all ball bearings in the head.

These heads are direct motor driven and mounted on ways and are moved in and out by hydraulic cylinders.

If you have a production problem, let Buhr engineers help you.

BUHR MACHINE TOOL COMPANY, Ann Arbor, Mich.

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

Almond Drill Chuck

The Original Manufacturers of Drill Chucks

The Almond Three-Jaw Drill Chucks were the first to be placed on the market. They were Pioneers in the field of Drill Chucks. For over seventy years Almond Chucks have formed a necessary part in the logical procedure of machine developments. Are made in types and sizes to fit all machine tools and portable drills.

Write for further information

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U. S. A.

HOLMAN

BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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BARNESDRIL

HONERS . . . DRILLERS

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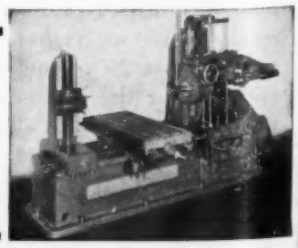
830 CHESTNUT STREET ROCKFORD, ILLINOIS

UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



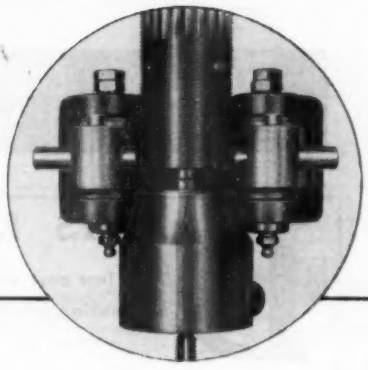
Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

YOU CAN'T WIN THE WAR ON REJECTS

Every tapped and threaded part that doesn't meet Army or Navy specifications — every reject — means just one more delay in war-winning production. Rejects won't win this war, nor the "war" for commercial supremacy to follow. Threads will always need to be precision cut, whether for today's armaments or tomorrow's pleasure and commercial goods.

Without boasting, without exaggeration, we can truthfully say that no tool will give you the accuracy of threads as speedily and as easily as the Bakewell Tapping Machine. Hundreds of internationally known concerns in the U.S., Canada and Great Britain will verify this statement.



PATENTED FEED CONTROL

The tapping accuracy of the Bakewell Tapping Machine is made possible by the well-known Bakewell leading on mechanism. This consists of a hardened and precision ground Bakewell lead screw operated in conjunction with electrically actuated brass guide fingers which take the place of the old style nut. These guide fingers are hobbed with the same threads as those of the tap and lead screw. The solenoid action of the fingers mates them with the threads of the screw against a spring tension insuring accurate lead of tap in and out of hole. All backlash is eliminated. Class 3, 4 and even 5 gage fits are cut in any material, soft or hard, with one pass. Taps are saved from breakage. Rejects are eliminated. A tremendous saving of invaluable time, hard-to-get labor, critical materials is gained.

If your specifications call for Army or Navy threads, check into the Bakewell Tapping Machine today.

ARMY E NAVY

BAKEWELL *Manufacturing Co.*

2023 SANTA FE AVE. • LOS ANGELES, CALIF.

PRECISION TAPPING MACHINES

5 DIFFERENT MODELS
Capacities from 0-80 to 4"

SIGOURNEY M-100

COMPLETE ENCLOSURE MEANS SAFER OPERATION

Today more than ever machine safety is important when relatively inexperienced operators must be used to maintain production. The new Sigourney M-100 drilling machine is ideally designed for use by such operators, as all moving parts except the chuck and drill itself are completely enclosed.

Another point that will appeal to today's harassed production executives is the rugged construction of this sensitive drilling machine . . . built to maintain an unusually high degree of accuracy under the hardest 24 hour use.

THE SIGOURNEY TOOL CO., Hartford, Conn.

IMMEDIATE DELIVERY ! !

Illustrated bulletin on request.

Sole Sales Agents

PRATT & WHITNEY

Division Niles - Bement - Pond Co. West Hartford, Connecticut

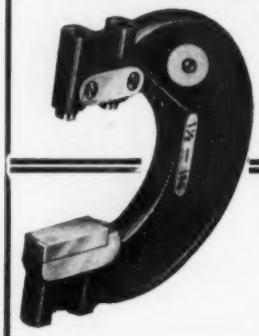
ARMY E NAVY

"E" TO UNIVERSAL FOR OUTSTANDING ACHIEVEMENT IN THE MANUFACTURE OF VITAL TOOLS . .

We are proud to announce that we have been awarded the coveted Army-Navy "E" in recognition of the quality and quantity of the Universal precision parts we have been producing for the war effort.

You can improve your jig operations with Universal Drill Bushings. They are straight and round and have superfinished bores for accuracy and long life. Write for complete catalog.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN



PHOENIX
ADJUSTABLE LIMIT
SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

Send for Folder

PHOENIX GAGE CO., Phoenix, N.Y.

DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1¼ in.

Write for illustrated bulletin

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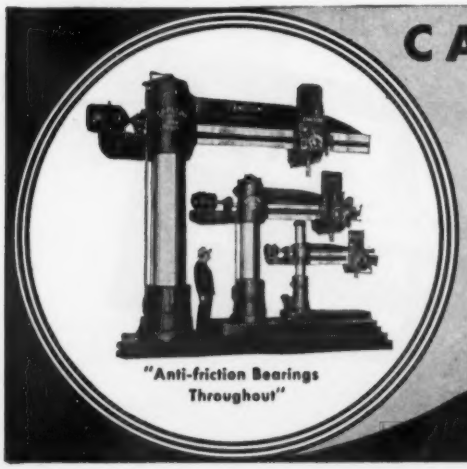
numbering, stamping and marking machines and accessories are extensively used where fast, accurate permanent work is a prerequisite.

THE ACROMARK CO. ELIZABETH NEW JERSEY



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

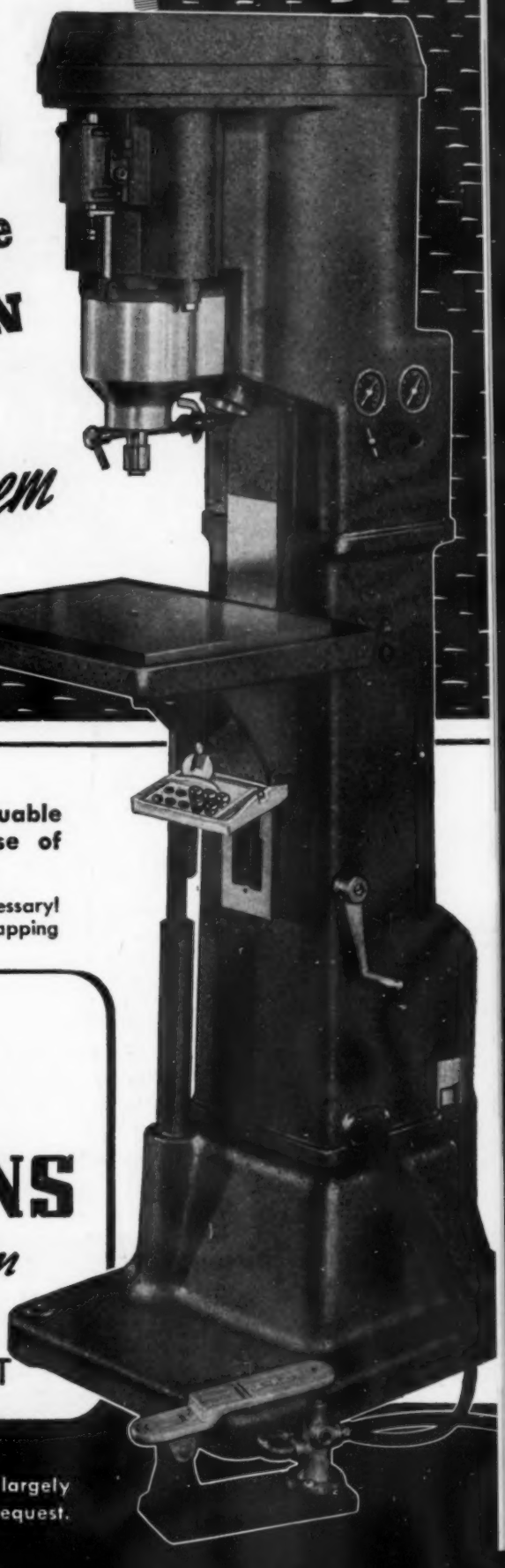
ARMY E NAVY

HAVING TOLERANCE PROBLEMS ON TAPPING OPERATIONS?

2 FEATURES

Insure Continuous, Trouble-Free TAPPING PRODUCTION

...and only Haskins has them



WITH HASKINS TAPPERS ON THE JOB there's no loss of valuable production time, no wasting of vital war materials, because of failure to maintain tolerance requirements.

Air **Operation** uniformly controls the accuracy of the work. To Class 4 fit when necessary! Each part is precision tapped *exactly* like every other, every hour of the day. Tapping pressure is always precisely the same. Thus tap life is longer—much longer. And tap breakage is almost completely eliminated.

Piece Part Control, applicable on many jobs, makes tapping practically automatic. Placing the part in the fixture actuates a micro switch and—*air does the rest*—starting and completing the tapping operation. The operator's two hands are free to feed parts—faster than by any other method.

That's why tapping the **Haskins** way is definitely more accurate, definitely less costly. R. G. Haskins Company, 2761 W. Flournoy St., Chicago, Illinois.

AIR Control

HASKINS

Precision

TAPPING EQUIPMENT

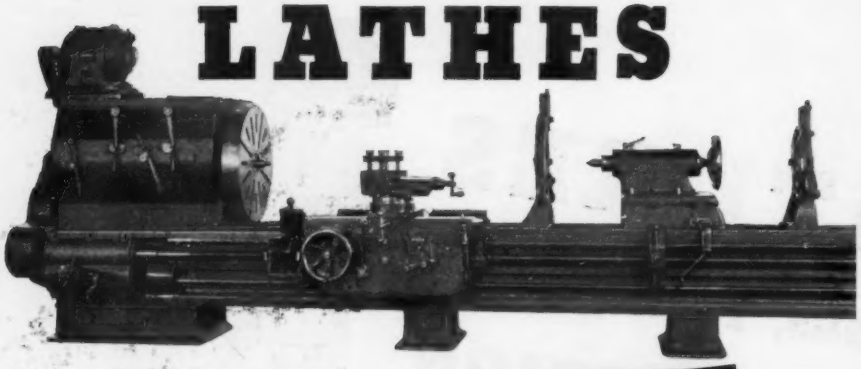
HASKINS

FOR ADDITIONAL TAPPING TIPS send for our latest literature, devoted largely to war work. Gives many money-saving, money-making ideas. Free on request.

Sommerfeld

(Formerly Pittsburgh)

LATHES



for FAST ROUGHING and ACCURATE FINISHING

SIZES AND TYPES

Sommerfeld Lathes are made in sizes from 27 inches to 60 inches inclusive. Illustrated is the high-production heavy-duty 32" lathe for turning only. The line includes heavy-duty types for boring and turning in any bed-lengths. In the larger sizes, 36" to 60", boring and turning can be done *simultaneously*, employing separate feed screws for each operation.

APPLICATIONS AND FEATURES

For large diameters, any lengths, tough materials and heavy cuts, Sommerfeld Lathes combine power with accuracy, to provide the high production rates demanded for war production. The design and construction features that give Sommerfeld Lathes their high productive capacity have been developed and refined through almost a half-century of experience in the machine tool field.

At the present time, we can quote six-weeks delivery from date of order on the 50 or 60 inch lathes (subject to prior sale). Write for complete details.

Sommerfeld
MACHINE COMPANY
BRADDOCK, PA.
Makers of Machine Tools since 1895

KNOW YOUR MATERIALS AND HOW TO WORK THEM

★

. . . send for these reprints of practical production data.

15¢ PER COPY

1 Working of Aluminum Alloys
2 Working of Magnesium Alloys
3 Working of S A E Nickel Alloy Steels
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• Here, in compact, easy-to-use form, are digests of authoritative Metal-Working practice followed in war-busy plants. Each reprint appeared originally as one of the well-known *American Machinist* "blue sections." Each details characteristics of a particular material or group of materials . . . tells what they are and how to work them. Production executives find these compilations useful in employee training.

Check over the list above . . . if you want any reprints order them now while our limited supply lasts. Coupon below for your convenience.

MAIL COUPON TODAY!

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Enclosed is $..... (stamps, money order or check) for the following "Working of Materials" reprints. (Price 15¢ each)

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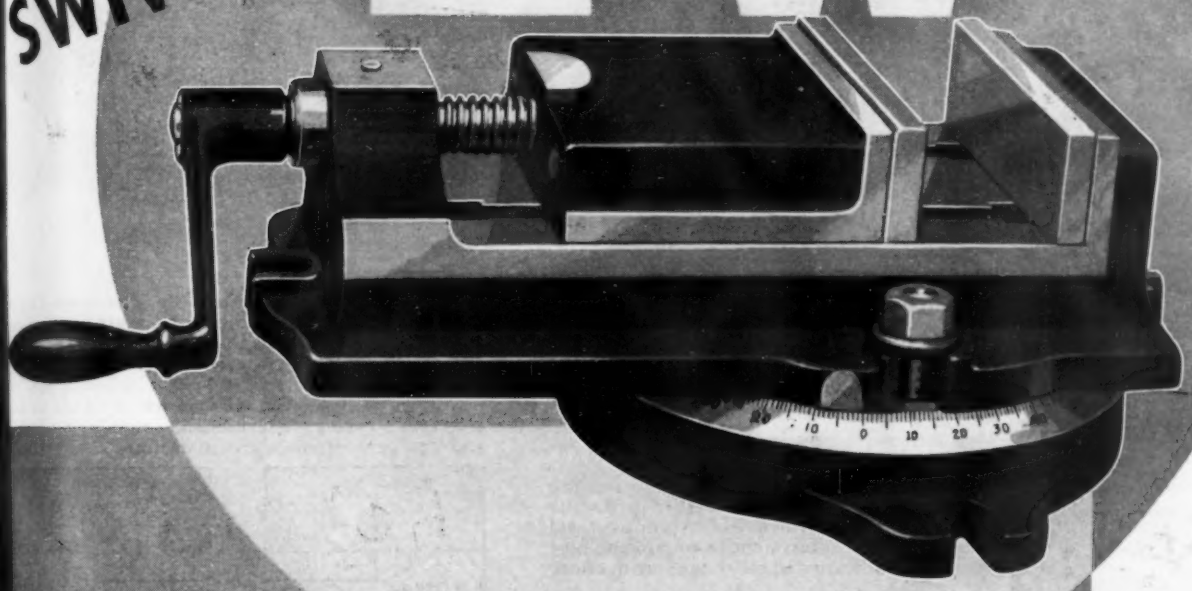
L-W SWIVEL BASE MILLING MACHINE VISES



6½" MASTER VISE

- Graduated Base, can be used plain or swivel
- Width of Jaws 6½ inches
- Depth of Jaws 2 inches
- Opens with Steel Jaws 4¼ inches
- Opens without Steel Jaws 5⅛ inches
- Weight complete with crank, boxed 90 pounds

4½" JUNIOR VISE

- Graduated Base, can be used either plain or swivel
- Width of Jaws 4½ inches
- Depth of Jaws 1¾ inches
- Opens with Steel Jaws 3 inches
- Opens without Steel Jaws 3¾ inches
- Weight complete with crank, boxed 50 pounds

Durably built of high grade semi-steel castings, these vises are suitable for Milling Machine, Drill Press or Shaper. The steel jaws are hardened and the large Acme steel screw contributes durability to both the large and small size vises. Four bolt and key slots are provided for attaching the vise rigidly to the machine table, so that work holding surfaces are at right angles or parallel to the table.

A new catalog is available . . . Send for your free copy today!

L-W CHUCK COMPANY

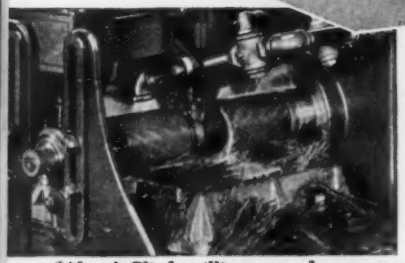
1-7 N. ST. CLAIR ST.
TOLEDO, OHIO

Also manufacturers of LATHE CHUCKS • DIVIDING HEADS • MAGNETIC CHUCKS • DEMAGNETIZERS • POWER HACK SAWS

To Maintain Both Production and Finish While Taking Heavy Milling Cuts . . .

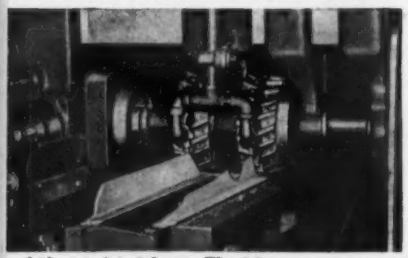
USE THE *fluid-screw* RIGIDMIL

These Heavy Jobs Need the Accuracy of a Screw Feed PLUS the Flexibility of Hydraulic Control . . .



(Above) Climb milling motor bases on a Model 33 Fluid-Screw Rigidmil equipped with a special work-holding fixture.

(Above) Model 33 Fluid-Screw Rigidmil form milling stepped grooves in guide rail parts.



(Above) Model 33 Fluid-Screw Rigidmil climb milling 8 surfaces of forged steel rib sections.

What the Fluid-Screw is . . .

The Fluid-Screw consists of a Sundstrand fluid motor (or hydraulic transmission) actuating a conventional table screw and nut. It offers the advantages of both hydraulic and mechanical feeding devices while eliminating their inherent disadvantages. This method of feed is incorporated in the Model 33 Fluid-Screw Rigidmil.

Its Advantages in Milling . . .

The positive feed makes it possible to perform either conventional or climb milling operations. Infinitely adjustable hydraulic feeds, together with a wide spindle speed range, permit adjustment to obtain the best cutting condition and maximum production.

Additional Features of the Model 33 Rigidmil . . .

The Model 33 Rigidmil is provided with a spindle speed range ratio of 30:1. It has a "double center drive gear" which provides two possible drive gear centers, and doubles the number of possible speed changes with each set of gears. Additional features of the Model 33 include automatic lubrication, rapid traverse rate of 300" per minute, separate feed and speed motors, square type table ways, precision bearing spindle and unit construction.

Wide Cycle Range for Both Conventional and Climb Milling . . .

Cycles are automatically controlled by dogs mounted on the front of the table. These are easily adjusted, and control table movements for a wide variety of cycles, including two-way cycles with skip feed in each direction, reverse from feed to feed, two feeds in each direction, and a different rate of feed (in one cycle) for each direction of the table. Dogs for 5 cycles are furnished as standard. Dogs and equipment for additional cycles also available.

(Above) Climb Cutting, left; Conventional Milling, right.

Use Sundstrand Engineered Production to Solve Your Milling Problems

In addition to the Model 33 Fluid-Screw Rigidmil, Sundstrand engineers have developed and designed a wide line of standard milling machines. These can be tooled to suit a wide variety of milling jobs. If standard machines cannot be tooled to suit your work, our engineers can design an economical special milling machine to increase production. They are at your service without obligation. Send complete, accurate information with each inquiry.

FREE DATA

This new 18-page booklet covers the features and specifications of the Sundstrand Model 33 Fluid-Screw Rigidmil. Write for your copy today. Ask for Bulletin 114.

Check These Basic Specifications For Your Heavy Milling Jobs*

MACHINE SIZE	33-1448	33-1472	33-1848	33-1872
TABLE—Max. Travel	48"	72"	48"	72"
Working Surface of Table	14" x 78"	14" x 102"	18" x 78"	18" x 102"
Top of Table to C/L of Spindle	4½" min.—18" max.	4½" min.—18" max.	4½" min.—18" max.	4½" min.—18" max.
Feed Range	½" to 60" per min.	½" to 60" per min.	½" to 60" per min.	½" to 60" per min.
Rapid Traverse Rate	300" per min.	300" per min.	300" per min.	300" per min.
Spindle Nose	No. 50 N.M.T.B.A.	No. 50 N.M.T.B.A.	No. 50 N.M.T.B.A.	No. 50 N.M.T.B.A.
SPINDLE SPEEDS (by pick-off gears)				
Type "AA" Head	13 to 400 r.p.m.	13 to 400 r.p.m.	13 to 400 r.p.m.	13 to 400 r.p.m.
Type "A" Head	20 to 600 r.p.m.	20 to 600 r.p.m.	20 to 600 r.p.m.	20 to 600 r.p.m.
Type "B" Head	40 to 1200 r.p.m.	40 to 1200 r.p.m.	40 to 1200 r.p.m.	40 to 1200 r.p.m.
SPINDLE MOTOR				
Type "AA" Head	5 or 7½ h.p.	5 or 7½ h.p.	5 or 7½ h.p.	5 or 7½ h.p.
Type "A" or "B" Head	7½ or 10 h.p.	7½ or 10 h.p.	7½ or 10 h.p.	7½ or 10 h.p.

*Larger and special sizes also available.

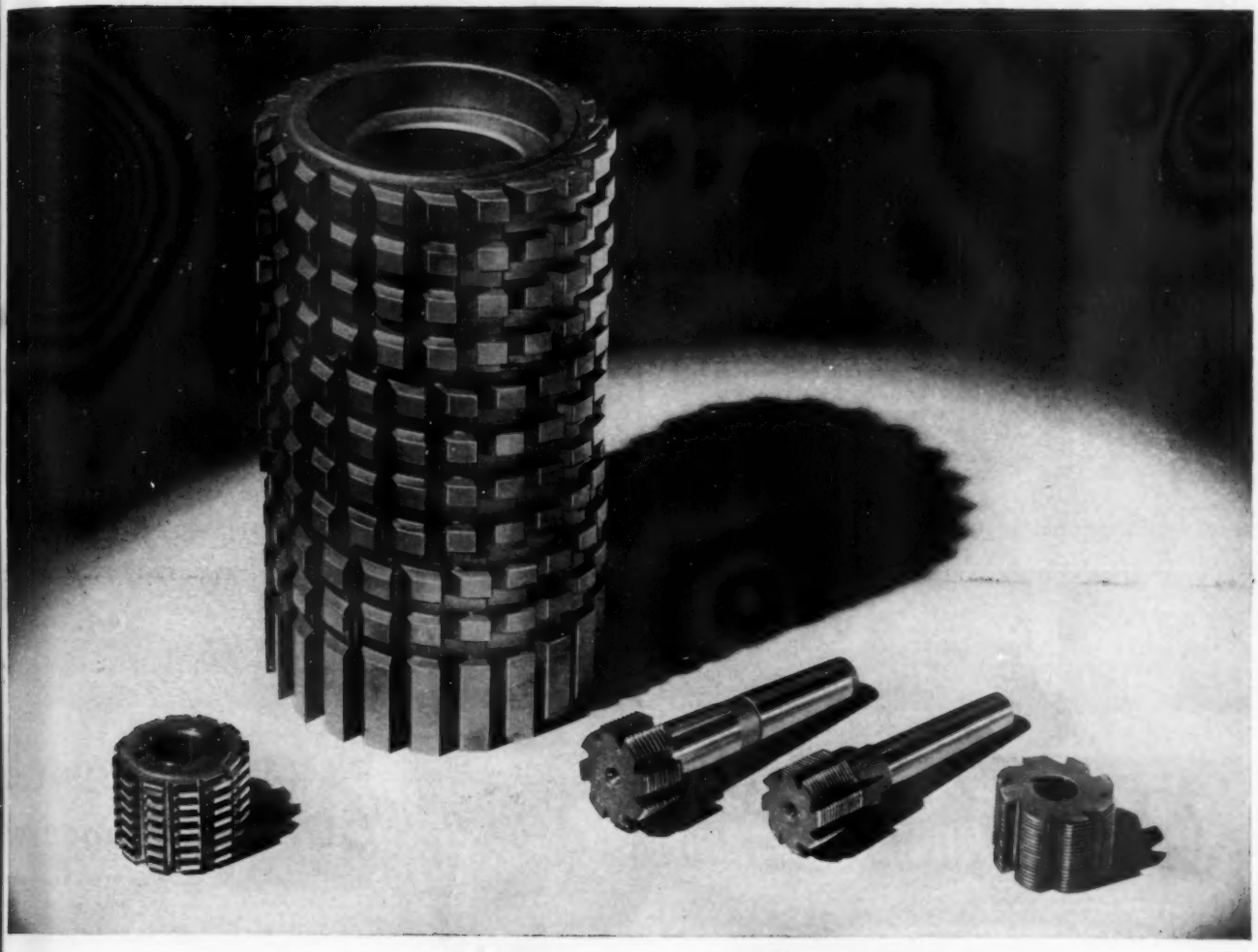
SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

ARMY E NAVY

SUNDSTRAND MACHINE TOOL CO.

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

PLAN-O-MILL



THREAD MILLING CUTTERS

Years of on-the-job experience—working with production men all over the country as each Plan-O-Mill milling machine was tooled for another job—told Plan-O-Mill engineers exactly what was needed for accurate, economical thread milling.

The result is the Plan-O-Mill Multiple Thread Milling Cutter, now proving its worth in factories and machine shops from coast to coast.

Plan-O-Mill Thread milling cutters are available ground or unground with straight or spiral flutes, in National, Whitworth, Acme, V, and special forms, for use on all types of thread milling machines. For speedy delivery give full details when ordering, including size of cutter; thread form, pitch, and direction; straight or spiral gash, and job description.

MILLING MACHINES

PLAN-O-MILL

MILLING CUTTERS

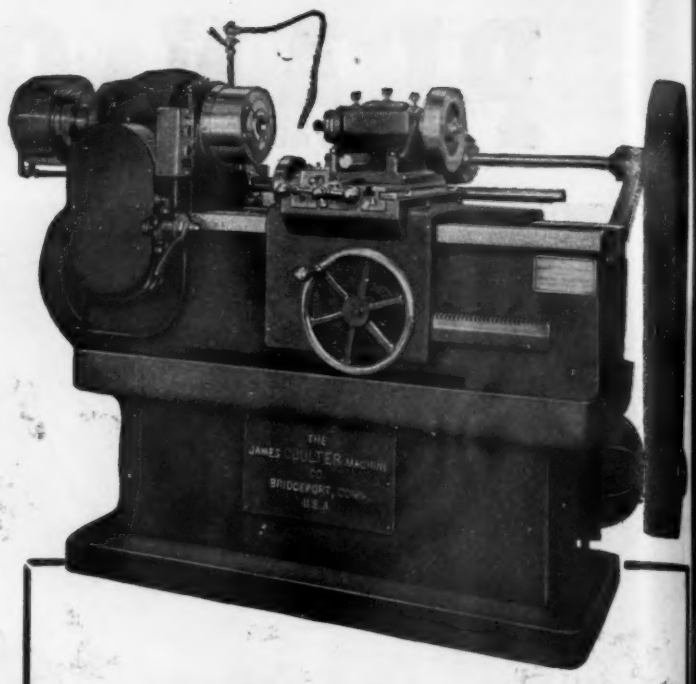
PLAN-O-MILL CORPORATION, 1511 E. Eight Mile Road, Hazel Park, Mich.

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



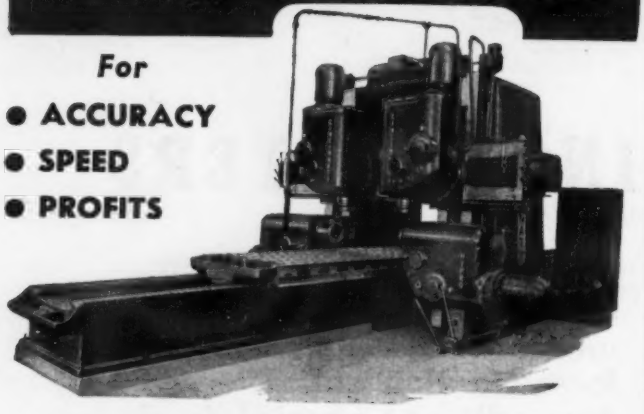
Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

CINCINNATI HYPRO
Planer Type MILLING MACHINE!

For

- **ACCURACY**
- **SPEED**
- **PROFITS**



• Here's a machine designed for maximum rigidity to produce better work at a high rate of production. Combination Herringbone Gear drive to table provides smooth flow of power and freedom from side thrust pressures. Sizes up to 120".

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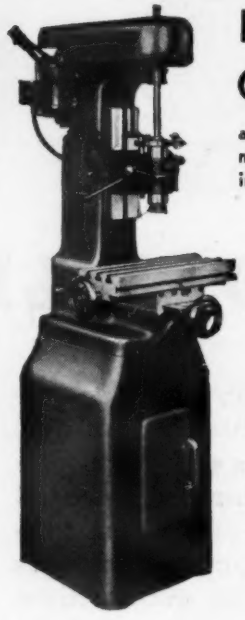
Manufacturers of full line of Double Housing and Openside Planers and Vertical Boring Mills.

THE CINCINNATI PLANER CO.
CINCINNATI, OHIO



FAST *Set-up,* PLUS QUICK *Changeover*

are machine features which every tool room needs to handle the continuous run of small important jobs that can't wait.

LINLEY
HIGH SPEED VERTICAL
MILLING and JIG BORING
MACHINE

is the answer to speed demands, versatility, accuracy and economy in a wide variety of die work, jig making, metal patterns, models, drilling, milling and reaming.

Eight spingle speeds—"a speed for every need."

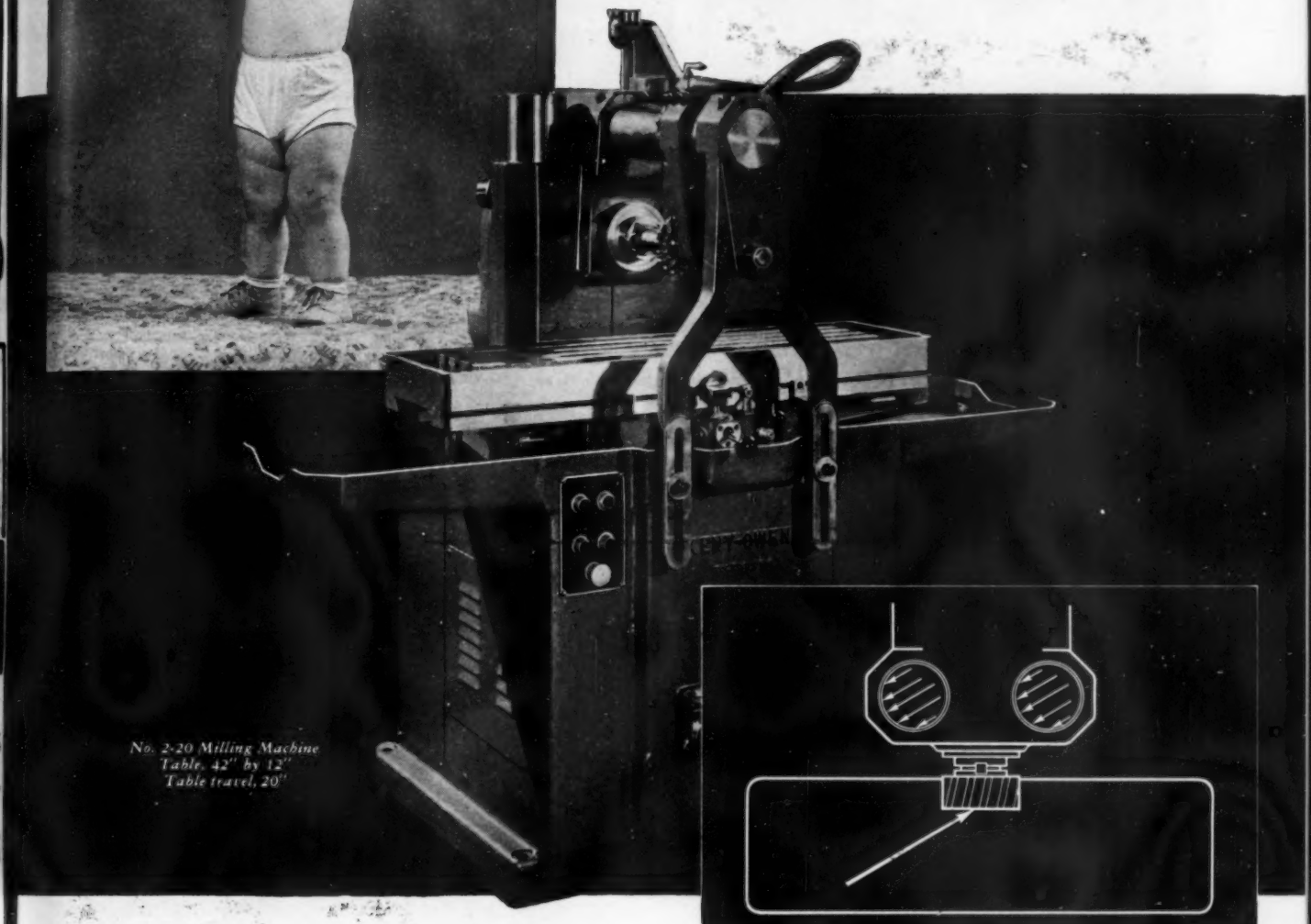
Direct micrometer depth guage setting—no pencil figuring errors. Small floor space required—only 18½ x 20 inches. A precision tool in the fullest sense.

ILLUSTRATED BULLETIN ON REQUEST

Linley Bros Co., 664 State St. Extension Bridgeport, Conn.

LINLEY BROS. CO., Bridgeport, Conn.

Balanced load!



No. 2-20 Milling Machine
Table, 42" by 12"
Table travel, 20"

Exclusive TWIN POST MOUNTING offers BALANCED LOAD IN EITHER DIRECTION

★ In Kent-Owens Milling Machines . . . the head is mounted on two cylindrical ground steel posts which carry the spindle midway between them. There is no overhang and no cocking action. The result is an unusually rigid and accurate machine which is practically chatter-proof for either direction of table travel. Write for latest bulletins. Kent-Owens Machine Company, Toledo, Ohio.

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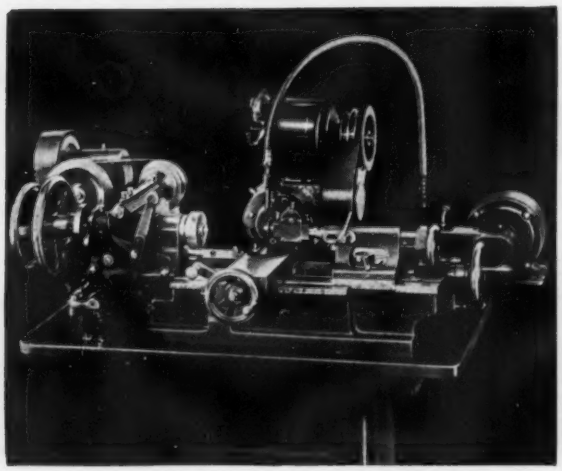
Call on KENT-OWENS *for Milling Machines*



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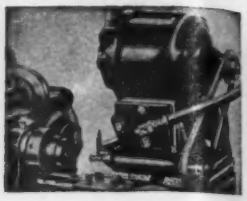
Quickly and Accurately milled . . .

ON

WALTHAM THREAD MILLERS



Waltham Thread Miller equipped with Internal Threading Attachment

Machine equipped with Relieving Attachment

■

Write for literature giving complete details and specifications.

SPECIFICATIONS

Swing over carriage 3"
Capacity (Diameter of work) 2" or smaller
Thread length (work held on centers) 8¼"
Thread length (work held in spring chuck at one end) 10"
Diam. hole through spring chuck ⅝"
Diam. hole through work spindle ¾"
Floor space 48" x 34"
Motors: 1/3-¼ and 1/6 HP.

Precision threading is put on a production basis by these fast, convenient, accurate Waltham machines. Cutters are available for all standard thread forms.

Machine is equipped with three motors—for speed, feed and oil. Individual speed change and reverse are provided for cutter and work. Motor speeds, controlled from a convenient central point, are available for cutting brass or steel.

A wide range of extra equipment and attachments can be furnished for extending the usefulness of this machine.

WALTHAM MACHINE WORKS

WALTHAM MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

● With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

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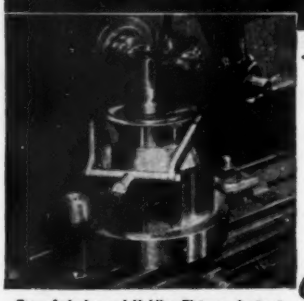
NATIONAL MACHINE TOOL CO.

CINCINNATI, OHIO

Have you perchance a small broaching job that simply will not yield gracefully to oversize broaching equipment? Please give us the details. Maybe we will be able to supply an answer with our . . .

New ZAGAR HORIZONTAL BROACHING MACHINE

. . . shortly to be announced. Meanwhile, *Zagar invites you* to lay your broaching problems before our engineering department.



Zagar Indexing and Holding Fixtures short-cut production, save time and make more money

Ask for Bulletin A-7

←Milling spring slots in collet with 2" Zagar Indexing Fixture, indexing 3 times at 120°. Part held very rigid. Set-up extremely simple. Performance trouble-free. Job would run on U.S. hand mill. Production: 54 milled slots per hour when using tool steel.

COLLETS

In stock — Zagar No. 2 and No. 6 Collets, similar to W. & S. No. 2 and No. 6 Collets.

ZAGAR TOOL, INC.

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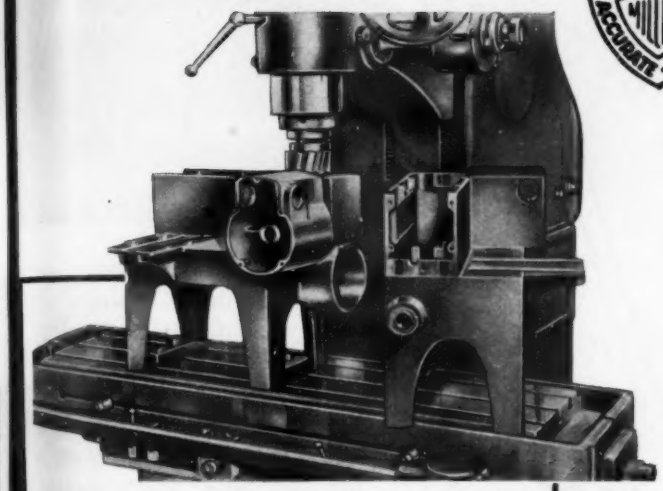
KNIGHT-Millers are easy to operate assuring Profitable Production...



Note This Example

In machining the odd shaped casting shown above, the operator had a clear view of the recess being machined and free access for checking width, depth, and finish.

KNIGHT Millers have wide range which adds speed to daily production. Sixteen changes in speed, in either direction, give the spindle ample range to meet a wide variety of requirements.

The unique swiveling table unit construction permits tilting it 35° to either side of horizontal for angular cutting. The swiveling and tilting feature save time waste in set-up work and broaden scope of the machine.

★ The operator always has a clear vision of the job whether he is sitting or standing. Working from one position he has grouped before him, within easy reach, one set of simple, convenient directional controls, for both hand and power operation. Speed and feed controls, with large, easy reading dials are centralized on the left hand side of the machine. The table height remains constant.

This feature of accessibility can well be figured upon to help you meet and beat production schedules as well as cut costs on an exceptional range of milling—drilling—boring—facing. Accuracy is a direct result.

All tool changes are made at the spindle nose. The KNIGHT Miller method of holding, driving, and changing cutters is positive, quick, and dependable. When the clutch is disengaged, a brake on the main drive shaft stops the spindle immediately, regardless of speed. You have an advantage in this for your operators can manipulate faster and make quicker set-ups—including the difficult ones.

Among other advantages is that of doing internal and external milling at one setting plus the fact that profiling, boring, and slot-milling is all done at one setting.

KNIGHT Millers, subject to prior order for immediate delivery. Write for catalog.

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •

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Tells you how to take care of small tools-Bolt Clippers, Files, Taps, Drills, etc. The boiled down facts to help you get the most out of these tools-use, wear, repair and selection. Handy pocket size. Just ask on a post card for— Porter's Tool Maintenance Book it's FREE

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PORTER CUTTERS

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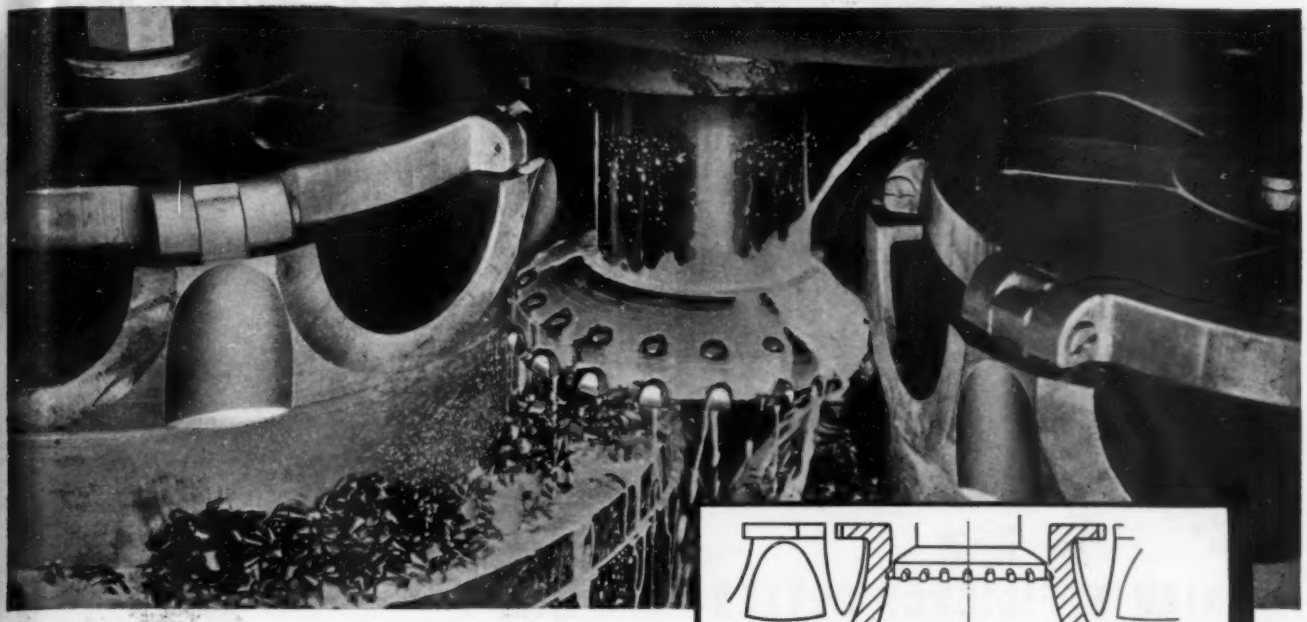
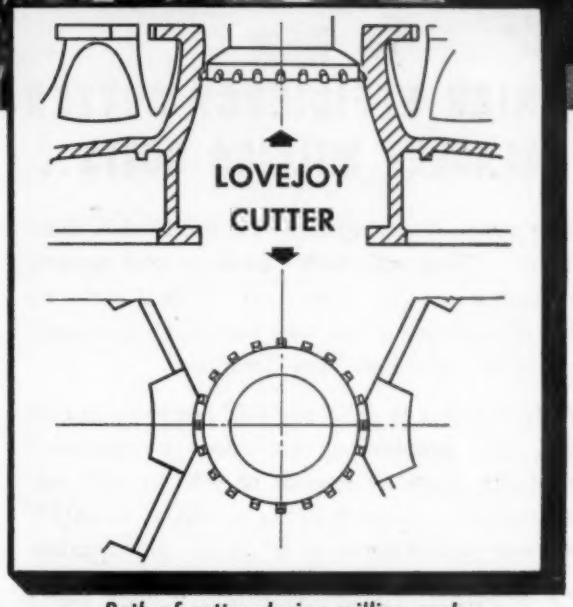


On unusual jobs
Specify LOVEJOY MILLING CUTTERS
For unusually fine results

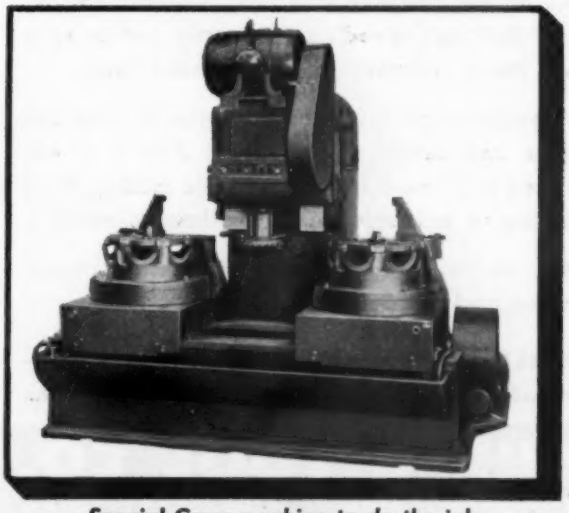
Aircraft engine parts require high production with the finest degree of precision and finish. Thus you usually find Lovejoy milling cutters on jobs of this kind.

The Cross Gear & Machine Co. developed the machine, shown here, for milling unusual shapes in two crankcase parts *in one setting*—Lovejoy designed and built the special milling cutters to do the job.

Call on Lovejoy for special or standard designs that may allow you to "double up" on jobs like the one shown here. Call on Lovejoy for recommendations based on solving thousands of usual and unusual milling problems.



Path of cutter during milling cycle



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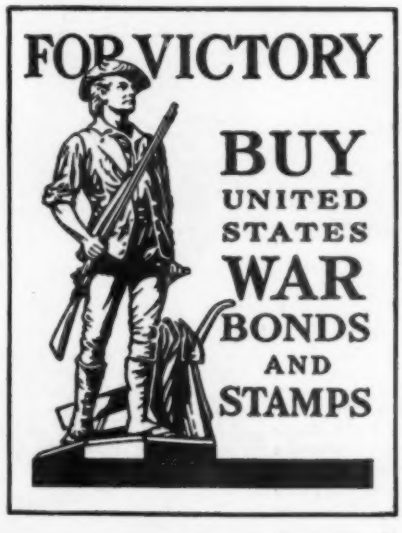

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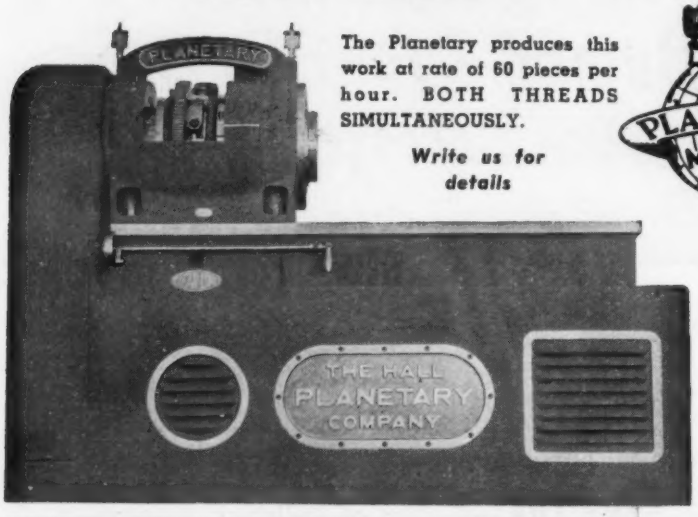

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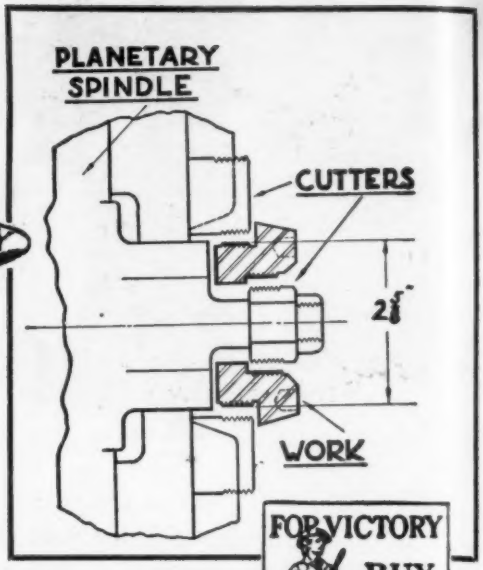

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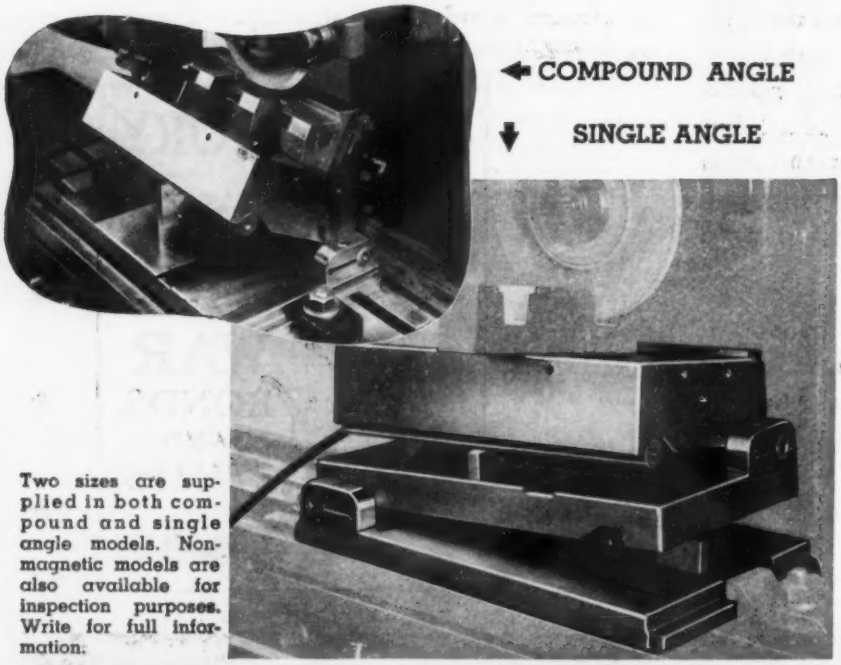

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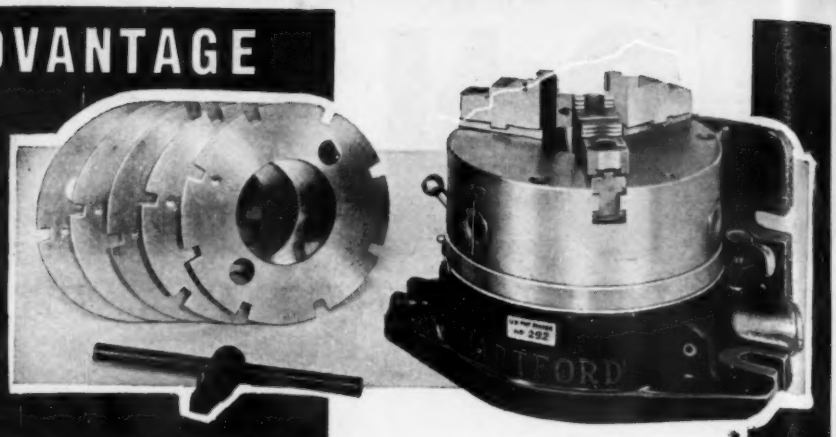

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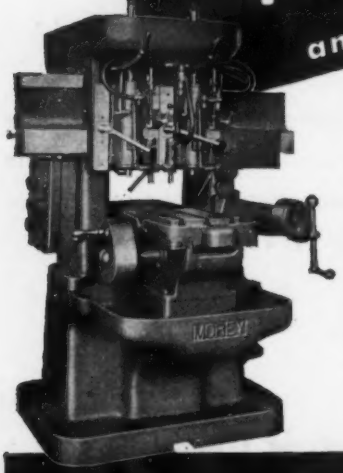

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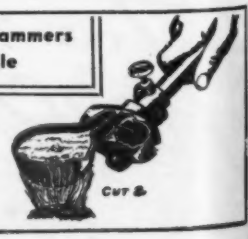

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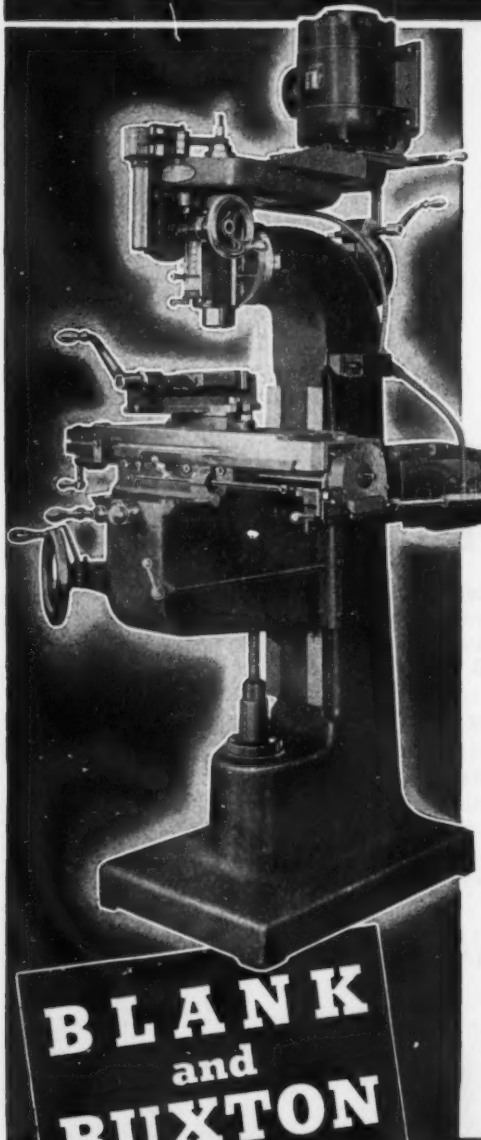

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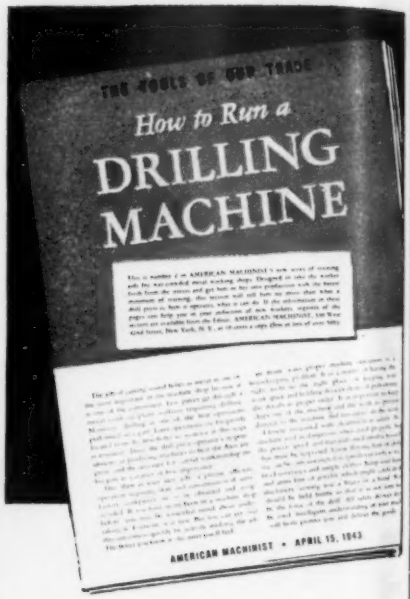

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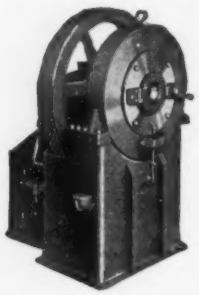

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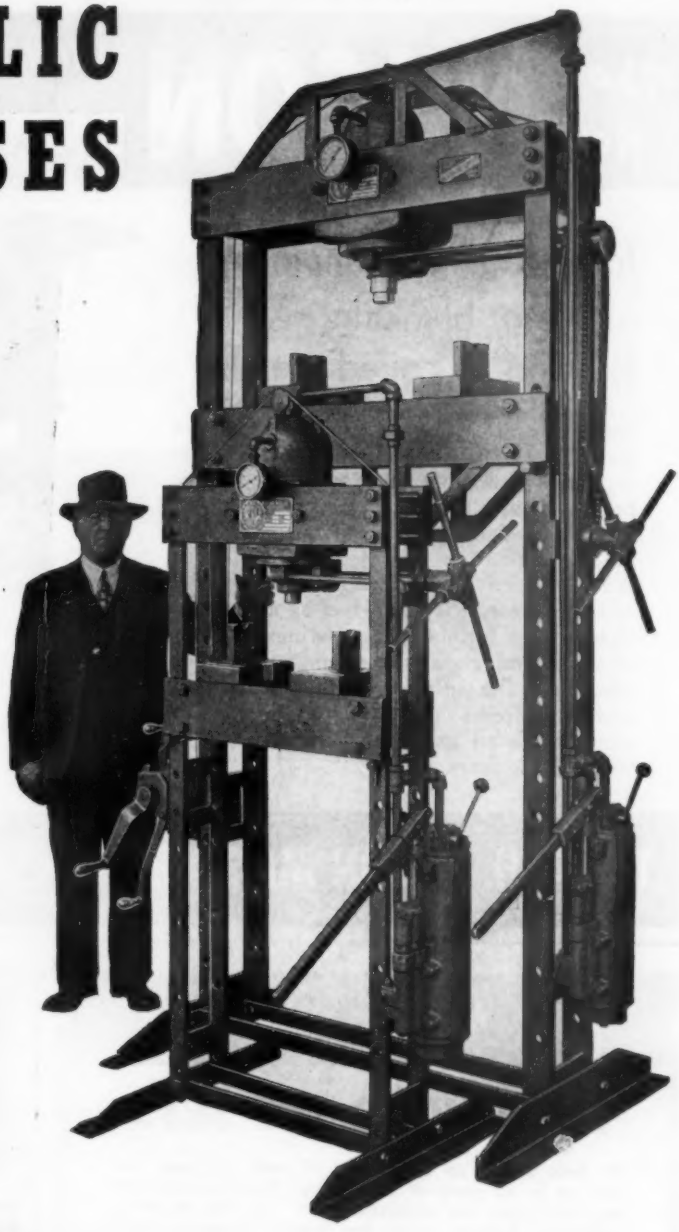

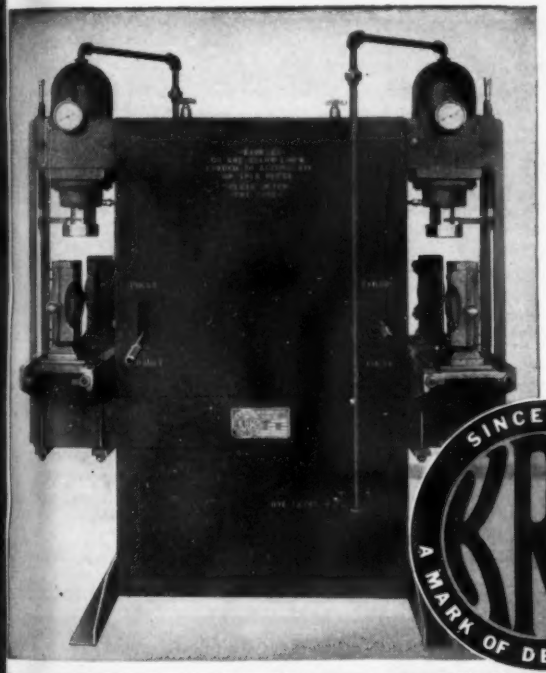

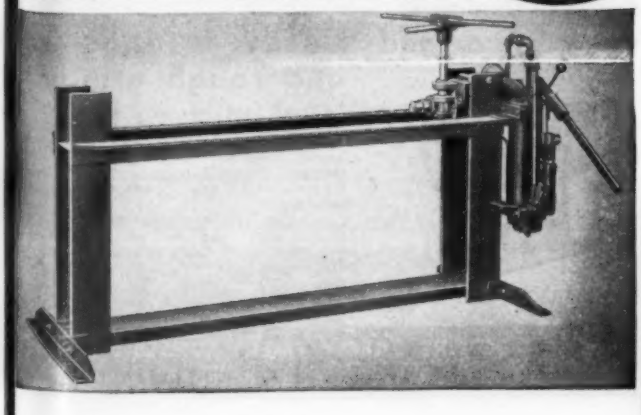

The exclusive design features which have given KRW Standard Presses their reputation for speed and efficiency are available to war production manufacturers who require presses of special design. The illustration above shows a *special*, extra high 75 ton KRW Press in comparison with the Standard 25 ton unit. Opposite illustration shows a special, 4-man operated, air-oil Press used for bomb loading. Press illustrated at lower left is a special horizontal design built to meet customer's requirements.

KRW also builds bench-type Arbor Presses in ½, 1 and 3 ton capacities.

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The New NILSON AUTOMATIC PRESS and FOUR SLIDE MACHINES

for swaging, stamping, piercing, blanking, forming of coiled metal

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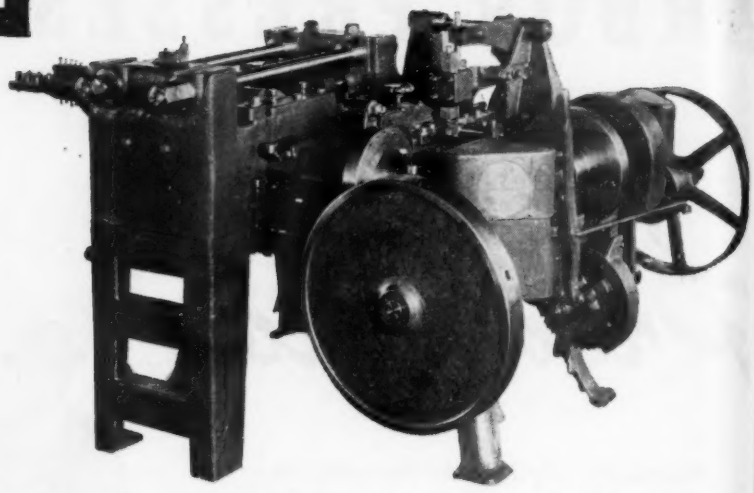

These machines are built in 2 sizes—for forming from 3/16" and ¼" diameter wire and for flat material 2" and 2½" wide. Send for 4-page bulletin giving complete details.

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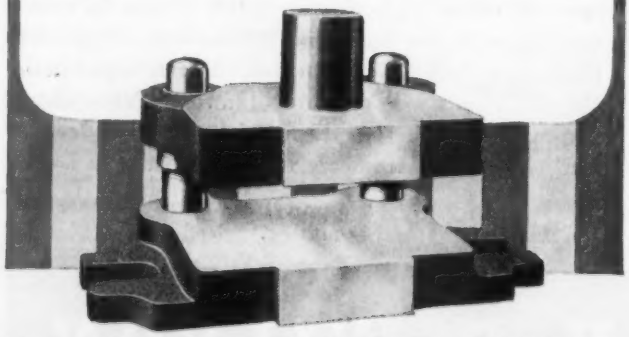
Pacific Coast users will find stock of Die Sets and Accessories at Jamison Steel Corporation, San Francisco and Los Angeles.

Our No. 9 Die Set Catalog gives complete engineering information on Die Sets and Die Makers' Accessories.



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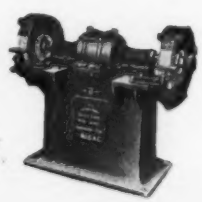

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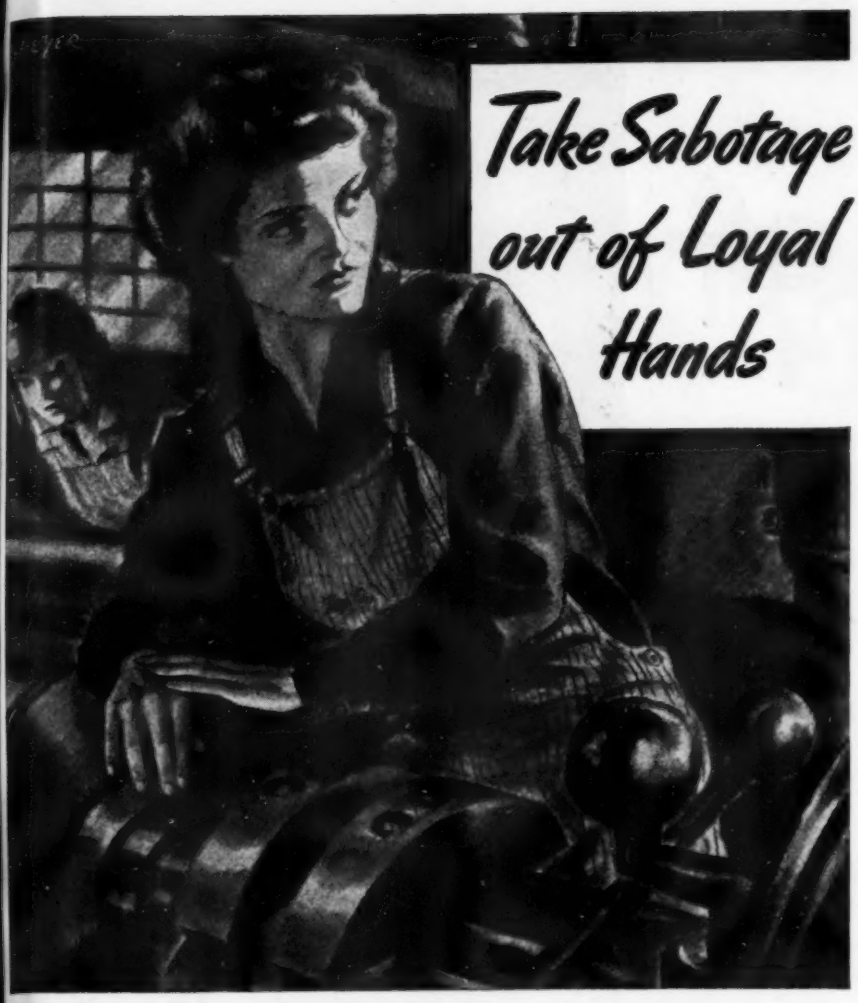

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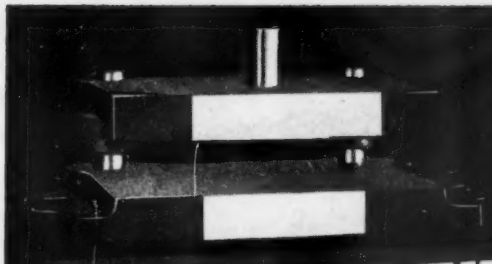

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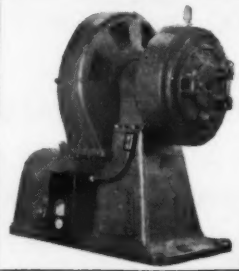

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with the NEW

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that locks in place and sets positively

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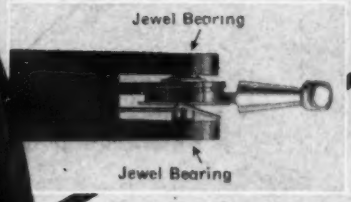
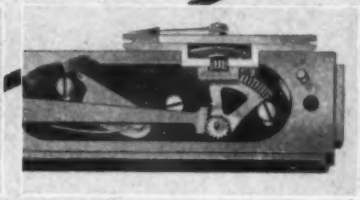


Serrations mesh positively. Interchangeable point locks on pivot. Low friction bearings.



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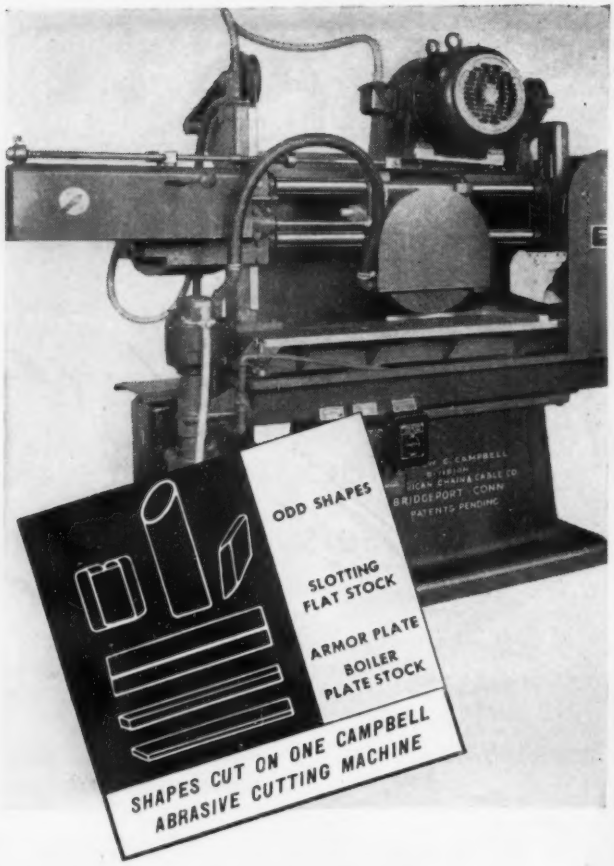

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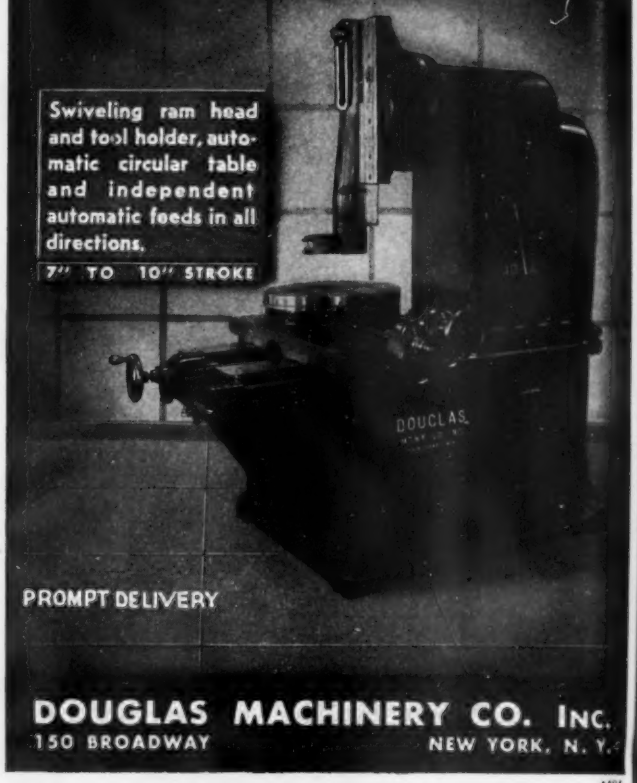
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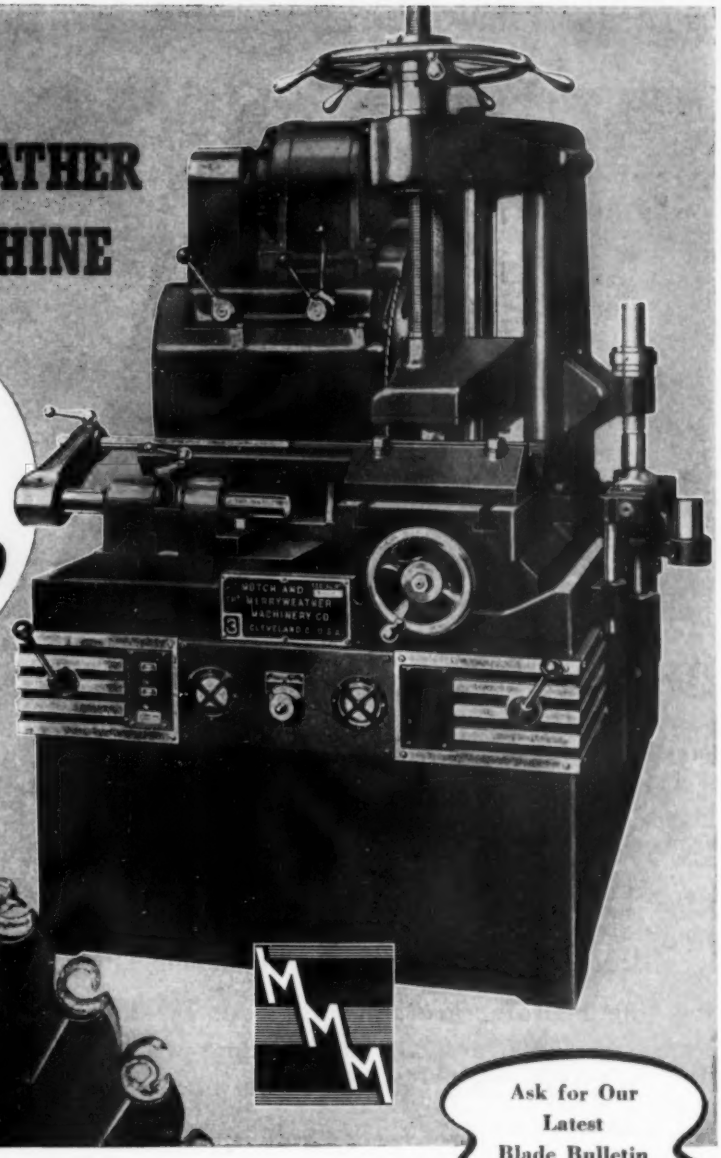

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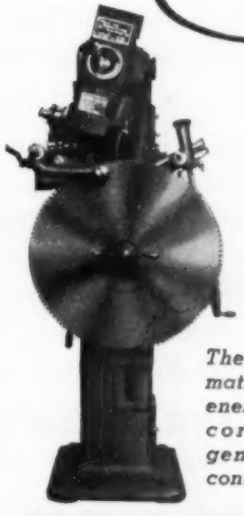

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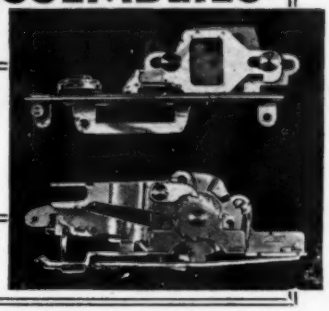

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BLOOMFIELD, N. J.

AUTOMATIC SCREW MACHINES

Large production capacity on several Gridley, Four Spindle, up to 1¾" Diameter New Britain, Six Spindle, up to 1½" Diameter Our skilled mechanics are a guarantee of your satisfaction. Send prints or samples for quotations on large quantities.

VETOOL MFG. CO. INC.
401 Broadway New York, N. Y.

WANTED

Work suitable for 4½" horizontal boring mill, table type. Size of table 33" by 60".

CW-622, American Machinist
330 West 42nd St., New York, 18, N. Y.

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.

GENERAL PATTERN WORKS
2223 Rusk Street Cincinnati, Ohio

AVAILABLE NOW
CYLINDRICAL GRINDING FACILITIES
Handle Stock to 4" x 13"
IMMEDIATE SERVICE
Let Us Quote You On Turning and Grinding
ACME EQUIPMENT CO.
W. C. Dept.
128 S. Clinton St. Chicago, Ill.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word minimum charge $2.00. (See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS. 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns — 30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M., July 23rd will appear in the issue of August 5th subject to limitations of space available

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense plant in Midwest; give experience and full particulars. P-593, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL MAKERS for defense plant in Midwest; give experience and full particulars. P-594, Amerian Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

ENGINEER—Research and Development by pump manufacturer, near New York. Diversified experience in high pressure hydraulic and low pressure rotary pumps. This job is long range research and development for both war and post war. Give full particulars in first reply. confidential, permanent. Write P-606, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ENGINEER, to carry-on, direct and expedite the development of new Mechanical Processes, Tooling and Electric Powered Machines and equipment. P-607, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FIRE PROTECTION ENGINEER and INSPECTOR. Permanent positions open in East, South, or Middle West, with large industrial fire insurance organization. Previous knowledge in this work not necessary. Applicant must be a technical graduate with manufacturing or engineering experience, and possess a good personality. Send photo with letter. Men subject to draft for military service cannot be considered. P-624, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MACHINE DESIGNER WANTED

We have an opening for a man with wide experience in the designing of automatic and semi-automatic machine tools and hydraulic control application to machine tools. Excellent advancement, opportunity for right man. Old established St. Louis concern.

P-619, American Machinist
520 No. Michigan Ave., Chicago, Ill.

WANTED

Powder Metallurgist—Laboratory Technican

Excellent opportunity with new division of established midwestern concern. To be in charge of research and production of custom fabricated parts.

MIDLAND DIE & ENGRAVING CO.
1800 W. Berenice Chicago, Illinois

PROFESSIONAL SERVICES

Engineering and Research Co.

MACHINE DESIGNERS
MECHANICAL ENGINEERS

High Production Dies, Tools, Jigs and Fixtures, Methods, Job Analysis, Consultants and Supervisors, Industrial Engineering and Research

Chatham Phenix Building, 29-28 41st Ave.
Long Island City, New York

POSITIONS VACANT

WANTED: Good experienced Machine tool designer. Splendid opportunity now and after war with old established machine tool builder. P-625, American Machinist, 330 W. 42nd St. New York 18, N. Y.

ONE OF OUR CLIENTS, a nationally known pen manufacturer, wants punch press foreman, also master mechanic with production experience, excellent present and future for competent men, in reply give details of experience and salary requirements. Thorndike Deland, 1440 Broadway 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

AUTOMATIC-SCREW MACHINE EXPERT. Experienced on Swiss Automatics, Brown and Sharpe, Cleveland and Multiple Spindle Automatics. Able to lay out cams for Swiss and Brown and Sharpe Automatics. 22 years experience. Age 40. Married, 2 children, citizen. Likes to locate in Connecticut. PW-610, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL ENGINEER, age 40, with varied experience and proved ability, desires supervisory position with aggressive Post-War company. PW-626, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES
OFFERED—WANTED
Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY WANTED

SALES REPRESENTATIVE for state of NEW JERSEY. One or two non-competitive accounts wanted in metal-working machinery or accessories. Established office and contacts. Graduate engineer competent and experienced in technical service-sales. SA-611, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N. W., Washington, D. C.

WANTED

WANTED, Steel Press Brake, 10 foot bed, ¼" capacity, open end. Must be in very good condition. Send all particulars. Multi Metal Co., 1350 Garrison Ave., Bronx, New York, N. Y.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see page 289.

FOR SALE

HOUSTON MACHINE SHOP

$20,000.00

Very profitable jobbing business. Wonderful post-war possibilities. Sale acc't. owner's health.

address—P. O. Box 1122, Houston, Texas

POST WAR PRODUCT

Wanted for purchase or manufacture, by a completely equipped manufacturing plant, which has an excellent sales organization.

Write us giving details of your product or item.

BO-627, American Machinist
330 West 42nd St., New York 18, N. Y.

Wanted; Machine Capacity For Sub-Contract Work

Responsible Advertiser contacting leading Detroit Ordnance, Air Corps and Navy Prime Contractors has Sub-Contract work for well-equipped Precision and Production Machine Shops. Only exclusive representation considered.

Write; all correspondence confidential.

CW-623, American Machinist
520 North Michigan Ave., Chicago 11, Ill.

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

PRIME LOANS TO

CORPORATIONS—Unsecured

INDIVIDUALS—Collateralized

LARGE Sums—LOW annual rates.

COLLATERAL DISCOUNT CORP.
Graybar Bldg.—New York City

FOR SALE

(Additional For Sale Advertising on pages 291-298)

SPECIAL

36" Bridgeport Boring Mill

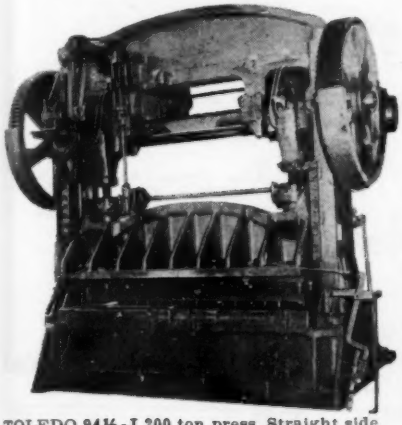
2—10"x36" Norton Grinders

MILLS MACHINERY SALES
3126 Grand River Detroit, Mich.

IN STOCK!!!

"FALK" for DEPENDABILITY in Rebuilt Machinery

TOLEDO 94½-J 200 TON PRESS



TOLEDO 94½-J 200 ton press. Straight side, tie rod, double twin, direct geared M.D. with 30 H.P. 3 ph. 60 cy. 440 V. motor & con. Forced feed lub., pneumatic controlled friction clutch & brakes. Bed area —120" right to left x 50" front to back. 12" stroke, 18" shee height. Bed equipped with spring cushions. Weight approx. 80,000 lbs.
Sanford No. 1½ Production Miller, Rotary Table.
Cleveland Vertical Miller No. 1 (New.)

GEAR CUTTERS

No. 12 Barber-Colman Gear Hobber.
#2 Whiton Universal Spur and Bevel Gear Cutter.

SHAPERS AND SLOTTERS

26" Cincinnati Triple Geared Shaper, Friction Drive.
20" x 20" x 36" N-B-P Shaper-Planer, Arranged Motor Drive.
12" New Haven Slotter.
16" Kelly Back Geared Crank Shaper, cone drive.
17" Smith Mills B. G. Crank, cone drive.

PRESSES, BRAKES & SHEARS

MARIETTA Power Press Brake 104" between uprights. Dual rams to permit operations on separate dies from both sides of press. Bed area 20" x 104", each rame 6¼" x 98". 4" crank shaft, 3" stroke. Excellent condition.
Ohl power press brake 8' x 3/16 cap.
Ohl power square Shear 8' 10 kauge.
Shaper Hydraulic Wheel Press 200 tons, 42" between strain bars, self-contained, belt drive.
Kutscheld all steel 36" x 16 ga. Foot Shear.
No. 132 Bliss 14 ga. 12" throat Slitter.
No. 232 Bliss 12 ga. 18" throat Slitter.

200 TON NIAGARA

1—Niagara #612 D press. Straight side, double crank, back geared, 200 ton cap., 3" stroke, bed 60 x 38.

TURRET LATHES

21"Gisholt Universal Turret Lathe with 3¾" hole in spindle, 2-step cone for 5" belt.
Jones & Lamson 3x36 Double Spindle, air chuck equipment.
Jones & Lamson 3 x 36 Single Spindle, Geared Head, Single Pulley Drive.
2—LeBlond 9"x16" Multi Cut Automatic Lathes, motor dr. has back facing attachments.

COILING MACHINES

No. 1 and No. 2 Sleeper & Hartley BX cable coiling machine, ⅜ and ½ in. capacity. Last used for speedometer cable. Complete.

RADIAL DRILLS

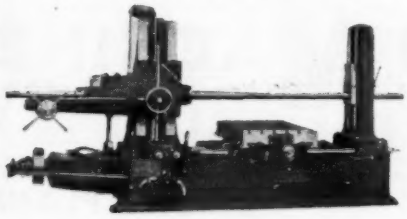
2—Niles-Bement-Pond, box column 5' arm.
1—Niles-Bement-Pond, box column 6' arm.

GRINDERS

No. 6 Besley Double Opposed Disc Grinder.
No. 2 and No. 3 Brown & Sharpe Cutter Grinder.
Badger No. 2 Double End Disc Grinder 16" disc, ball bearing spindle, Universal table.
Gorton, double end Disc Grinder, 18" discs.
Greenfield No. 12, Hydraulic Feed, motor drive; cap. swings 15", Grinds automatically ¾" to 5" di., 4" deep, New in 1928.

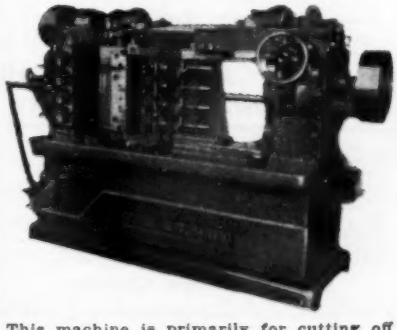
#32 LUCAS "PRECISION"

Boring—Drilling and Milling



Lucas #32 precision horizontal boring, drilling, and milling machine, 3¾" Bar. Extra length bed and table. Silent chain motor drive. 7½ H.P. G.E. 3 ph., 60 cy., 440 v' Push button control. Fully Guaranteed.

1¼" CONE AUTOMATIC CUT OFF



This machine is primarily for cutting off bar stock, or tubing. Can be arranged for light forming, chamfering and drilling. Size 1¼" round, 1 5/64 hex; ⅞ sq. max. feed 12" wt. 10,000 lb. with 15 H.P. motor.

#98 NIAGARA HEAVY PRODUCTION FOLDER

6' x 14 gauge capacity. Ar. M.D.
Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) ⅜" to 1⅝", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

MODEL G CLEVELAND GAP PUNCH

Vertical Cleveland, model G open Gap Punch. 52" throat, arch Jaw, 2" hole thru 1" plate cap. arrange for Gear motor drive. 10 H.P., 3 ph., 60 cy., 220 v.

Buy From Stock

MACHINERY

Tel. Main 6347

FALK MACHINERY CO.,

18 WARD ST.

MERCHANTS

ROCHESTER 5, N.Y.

GEAR MACHINES

36" G. & E. Cutter
B. & S. No. 3-26" Cutter
Gleason 11" Bevel
Fellows No. 6, 61 Sharper

BORING MILL

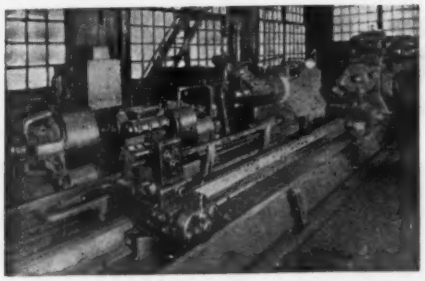
2½" G. & Lewis, M. D.
2½" Binsee
10' Niles Vert. 2 heads
3½" Rochester, M. D.
4", 4½" Gisholt and Niles
54", 60" Colburn, M. D., 2 heads
36" Bausch, Niles 2 heads
42" Bullard, 2 heads
36" Bullard Vtl Turret

LATHES

48" x 26' Niles
48" x 14' B. & Emmes Q.C.
26" x 14' Rahn-Larmon, rais. blks. to 34", Q.C.
36" x 21' Wickes 3 step, Q.C.
30" x 20' LeBlond Std. chg.
24" x 12' LeBlond, M. D.
26" x 24' Putnam, S.Q.C.

AUTOMATICS

3—Potter & Johnston No. 6A Turret Lathes, M. D.
10—Gridley ¾"—4¼" sgl. and multiple spindles



50" x 28'

NORTON

ROLL GRINDER, M. D.

MILLING MACHINES

Cincinnati No. 4 Vert., SPD
Cincinnati No. 5 Plain, M. D.
B. & S. No. 33, M. D.
Milwaukee No. 3 Vert., S.P.D.
Cleveland No. 2 Univ., S.P.D.

GRINDERS

P. & W. 14", M. D., B. B.
Norton 12 x 18", M. D.
Landis 14 x 52", S.P.D.
Modern 12 x 28" M. D.
B. & S. No. 10, 11, 14
Blanchard 26" Surface S.P.D.
Diamond 12 x 36", M. D.

TURRET LATHES

Gisholt 24", 6¼" hole
Gisholt 28", 3¼" hole
Gisholt 21", 3½" hole
Libby 18", S.P.D.
King 34" VTL. Turret
W. & S. No. 3A, S.P.D.
Foster No. 1B, S.P.D.

HYDRAULICS

Elmes 600 ton Hobbing press, 18" ram, 10" stroke
1—Elmes 1⅛" x 4" Horiz, 4 plunger pump, 6½ GPM, 5000#, WP.
1—W-F 1000 ton press, 20" ram, 7" stroke
1—W-F High-Low Pump, 60 GPM at 300#, WP., 3 GPM at 6500 High WP
1—500 ton press, 15" ram, 16" stroke, 28" x 34" platen
1—Triplex Pump 1 x 5, 1000 cu. in. 6000# WP.

Write • Wire • Phone

AARON MACHINERY CO.

45 CROSBY STREET **CAnal 6-0421-2** **NEW YORK CITY, N. Y.**

LATHES

12"x4' Sebastian Gd. Hd.
14"x6' Mulliner—cone

GEAR MACHINERY

24HS Gould & Eberhard Gear Hobber, M.D.
9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel gear generator No. 61 Fellows
Cimatool gear chamfering, M.D.
Lees-Bradner Gear Grinder
Lees-Bradner 6"x5¼" spline-Gear Hobber, M.D.

TURRET LATHES

6x6½" Goss & DeLeeuw
3¼x36" Jones & Lamson, M.D.

MISCELLANEOUS

8" Bullard Multimatic M.D.
36'x36"x8' Woodward & Powell Planer Rev. M.D.

DRILLS

New Delta Drilling Equip.
4' Spindle Taylor & Finn, M.D.

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge, Mass.

REBUILT PLANERS AND LATHES

AVAILABLE FOR IMMEDIATE INSPECTION AND DELIVERY

1—48"x36"x18' Detrick & Harvey Openside Planer
2—42"x42"x12' Pond Heavy Duty Double Housing Planers
1—36"x36"x12' Betts Heavy Duty Double Housing Planers
1—36"x36"x10' Gray Heavy Duty Double Housing Planers
1—24"x24"x6' Gray Double Housing Planer
1—24"x12' Putnam Engine Lathe
1—20"x10' Flather Engine Lathe
1—20"x 6' Flather Engine Lathe
1—18"x 6' Monarch Engine Lathe

ATLANTIC MACHINERY CORPORATION
149 BROADWAY **NEW YORK, N. Y.** **WOrth 2-0662**

BORING MILL, 54" N.-B.-T., B.P.T., M.D.
GEAR PLANERS, Bevel, 36" & 54" Gleason, M.D.
LATHE, Turret 3-A W & S H.S. 3¼", M.D.
LATHE, Turret 27" Libby, 7¼" H.S., M.D.
LATHE, Turret 34" Gisholt, 4¼" H.S., M.D.
MILLER Plain No. 1 Cincinnati, M.D.
PRESS, Dbl. Crk. 95-B Toledo, bed 55" x 54".
PRESS, Toggle No. 14 Bliss, stroke 18.
PRESS, Hydr., 1000 ton Wood, platen 42" x 9'.

Lang Machinery Company
28th St. & A. V. R. R. **Pittsburgh, Pa.**

36" x 24' **PUTNAM** Heavy Duty Triple Geared Internal Geared Faceplate Drive Engine Lathe. Arranged for motor drive. Swings over ways— 39". **NILES-BEMENT-POND** Horizontal Boring Drilling and Milling Machine, 4½" bar, table type machine. Motor drive.

ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY
2269 Woolworth Building New York, N. Y.

IMMEDIATE DELIVERY

1—No. 12 Type C Natco Multiple Spindle Drill, M. D.
2—Red Ring Gear Lappers, M. D.
1—Model B 1¼" Cleveland Automatic M. D. S. S.
1—New Hall Planetary, M. D.
1—Ingersoll-Rand air compressor M. D. Imperial Type 10.
1—No. 1 Bauch Multiple Spindle Drill, M. D.
1—No. 18 Gardner Semi-Auto Disc Grinder, M. D.
1—No. 6-B Riveting Machine, M. D.
1—No. 29-D Linnley Spinning Machine, M. D.

Central Machine Tool Corp.

4037 Upton Ave. **Toledo, Ohio** **1425 Nicholas Bldg.**
(Tel. Lawndale 8227)

Announcement—

NOW AVAILABLE FOR REBUILDING YOUR TOOLS

ReMANUFACTURED
-(ORIGINATED BY US)-
MACHINE TOOLS
Reg. U. S. Patent Office

The service that set a standard for the rebuilding of used machine tools

"RE-MANUFACTURED" was adopted as a trade name in 1914 to indicate the thorough manner in which the Hill-Clarke Machinery Company rebuilds used machine tools. Since then it has stood for the best in used tools that can be bought.

"RE-MANUFACTURED" represents what the word implies. It means the dis-assembling of a machine for complete inspection. It means the replacement of worn parts, resurfacing, refinishing and re-assembling, all carefully done by competent, trained mechanics. It means final testing under power, for both operation and accuracy, to assure the same performance available in a new tool.

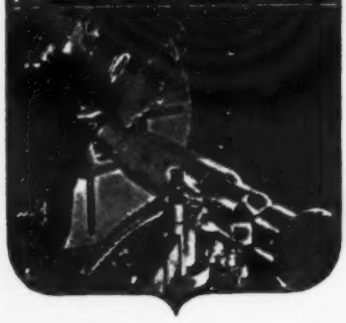
Now this time-tried "RE-MANUFACTURED" service is available to you for the rebuilding of your own machine tool equipment. We offer you the facilities of a specially designed rebuilding plant, completely equipped, and with a staff of trained mechanics.

Only Machines for War Production Accepted

HILL-CLARKE MACHINERY COMPANY

651 Washington Blvd. **Chicago, Ill.**

KEEP 'EM RUNNING!



Every machine listed in this column is in our warehouse at press time.

●

No. 3 WARNER & SWASEY Universal Hollow Hex. Turret Lathe, 3 1/8" capacity, Belt or Motor Drive.

No. 39 NATCO Straight-Line Drill, bored for 12—1 1/2" spindles M.D.

10' x 3/16" NIAGARA Squaring Shear.

42" PUTNAM Double End Car Wheel Lathe, M.D.

47" N.B.P. Double End Car Wheel Lathe, M.D.

No. 1 L & A Multiple Punch, 100 tons, 72" between housings

6" x 6" x 5/8" Double Angle Shear.

Beam Shear 20", 60# and smaller.

60" Throat 8" x 1 1/16 Shear.

54" Throat 1 3/4" x 1 1/8" Punch.

3 1/4" x 12" TRIPLEX Pumps, 1500 to 2000 lb. pressure, 60 to 70 GPM.

15" GLEASON Bevel Gear Generator.

30" x 30" x 10' NEWTON Slab Miller horizontal arbor, M.D.

52" Rotary Planer, M.D.

48" x 48" x 24' NBP Heavy Planer, Two Rail, One Side Head, Motor Drive.

48" x 48" x 20" PATCH Planer, 4 heads, 230 Volt D.C. Rev. Motor Drive.

24" NEWTON Cold Saw, 7 1/2" capacity, M.D.

SIMMONS ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORP.

1759 North Broadway, Albany 1, N.Y.

N. Y. Office: 149 Broadway

. . IN STOCK

AUTOMATICS

7/8" Gridley Model G, four spindle
1 1/4" Model F Gridley, four spindle
No. 515 National Acme, four spindle
2 1/2" Cleveland Model A, single spindle
5/8–7/8" Cleveland Model B, single spindle

BROACHES

American Hydraulic
Oilgear Hydraulic

DRILLS

20" Prentice Upright
26" Aurora Upright
36" New Haven Upright

GEAR CUTTERS

No. 65 Fellows Gear Shaper
No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

22" x 48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
30" Diamond Face, 84" Table Travel
12" Walker Rotary Surface
6" x 32" Norton Cylindrical
14" x 50" Norton Cylindrical
No. 4 Landis Universal
No. 60 Heald Cylinder

LATHES

14" x 6' Lodge & Shipley, c.d.
18" x 8' Lodge & Shipley, c.d.
7" x 52" Fitchburg Lo Swing, g.h.
9" Sundstrand Manufacturing, g.h.
No. 12 LeBlonde Multicut, g.h.

TURRET LATHES

No. 2 Acme Full Universal, g.h.
No. 2A Warner & Swasey, g.h.
No. 2B Foster, g.h.
18" Steinle, g.h.
24" Steinle, g.h.
No. 6A Potter & Johnston, g.h.

MILLS

54" Colburn Vertical Boring, m.d.
42" Niles Bement Pond Vertical Boring, m.d.
No. 2 Cincinnati Plain, s.p.d.
No. 3 Ryerson-Conradson Plain, s.p.d.
No. 12 Brown & Sharpe, c.d.
No. 3 Brown & Sharpe Vertical, s.p.d.
4" Pratt & Whitney Spline

MISCELLANEOUS

No. 1 Lapping Machine
10" x 16 Ga. Ohl Squaring Shear
42 1/2" x 3/16" Niagara Shear, m.d.
No. 8 Whiting Comb. Punch & Shear
No. P2 Ferracute Press

PLANERS

24" x 24" x 8' American, m.d.
38" x 38" x 12' Niles, m.d.

RESTORE YOUR WORN MACHINES

by having us rebuild them. We have a complete rebuilding department operated by men thoroughly trained in rebuilding. Your machines are taken down, carefully checked for wear, and worn parts are replaced, bearings and ways scraped and refitted. You'll find when rebuilt by us they'll perform like they did when they were new.

Write, Wire or Phone Us.

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.

1959-69 South Meridian Street
INDIANAPOLIS, INDIANA

44 WHITEHALL STREET, NEW YORK, N. Y.

EASTERN OFFERS FROM STOCK

AIR COMPRESSORS

Worthington 2 stage, 2 H.P. motor
United States, 1 phase motor
6x6" Curtis Vertical

ARBOR PRESSES

King Screw Press, 36" between housings, s.p.d.
Barnes Screw Press, hand operated
15 ton Lucas High Pattern Power Forcing

AUTOMATICS

4 spindle 7/8" Cleveland Model M, m.d.
2 1/4" Gridley Single Spindle, m.d.
3 1/4" Gridley Single Spindle, m.d.
No. 6D Potter & Johnston Automatic for brake drum work
No. 22, 23, 33 New Britain Automatics

BOLT THREADING MACHINES

3/4" Style R Economy Auto. Threading
No. 11-S Rickert-Shafer Automatic Threading, m.d.
American Bolt Heading Machine, 1 1/4" cap.
1 1/2" Acme, cone

HORIZONTAL BORING MILLS

No. 0 Fosdick Horizontal
No. 31 Lucas Horizontal
4" double spindle Barrett, m.d.
Sargent Floor Type, 2 3/4" bar
3 1/4" Bloomquist & Eck Horizontal

VERTICAL BORING MILLS

24" Bullard Spiral Drive, m.d., side head
42" Colburn, H.D., 2 swivel heads
42" Niles-Bement-Pond Car Wheel Borer, facing attach.
48" Niles-Bement-Pond Car Wheel Borer
52" Gisholt, m.d., 1 swivel, 1 turret head

BROACHING MACHINES

Cincinnati Milling Mach. Mill Broach, m.d., new
No. 2 LaPointe, belt
No. 2 LaPointe of Hudson, belt
No. 3B. J. N. LaPointe Double, belt

SAWS

7x7" Atkins Kwik-Kut Hack
Espen-Lucas Cold Saw, m.d.
6" Arey Milband
5" Newton Cold
No. 2B Cochran-Bly Cold
No. 3, 8 Nutter & Barnes Cold
No. 5, 6 Cochran-Bly Cold
No 11 1/2 Higley Cold
6x6" Klemm Tilting Hand
No. 15 Lea-Simplex Cold

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No. 2L Gisholt, hardened ways, m.d.
No. 3 Cincinnati Acme Full Universal, geared head, m.d. (3 in stock)
No. 3 Libby Turret, m.d. in base, latest type, Timken Bearings (2)
No. 2A, 3A Warner & Swasey Universal
3x36" Jones & Lamson Geared Head, bar
3x36" Jones & Lamson Geared Head, chucking
2 spindle 3x33" Jones & Lamson, chucking
18" Libby Type A Turret, m.d.
26" Libby Type C, m.d.
20"x7" American Turret, cone
28" Gisholt Turret, cone
Woods Tilted Turret, cone

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No. 3 Gray Sheet Metal Cutter, 5/8" cap., 36" throat
No. 34 Lennox Rotary Bevel Shear, 3/4" cap.
Quickwork Circle Shear, 30" throat
Southwark Rotary Metal Cutter, 3/8" cap. 36" throat
8'—18 ga. Niagara Foot Power Square Shear
8'—10 ga. Robinson Power Leaf Brake
10'—10 ga. No. 204 Dreis & Krump Power Leaf Brake, m.d.
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McCabe Pneumatic Flanger, 1/2" cap.
Niles-Bement-Pond Flanger, 8' hand operated
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Magee Sheet Metal Wiring & Edging Machine, m.d.

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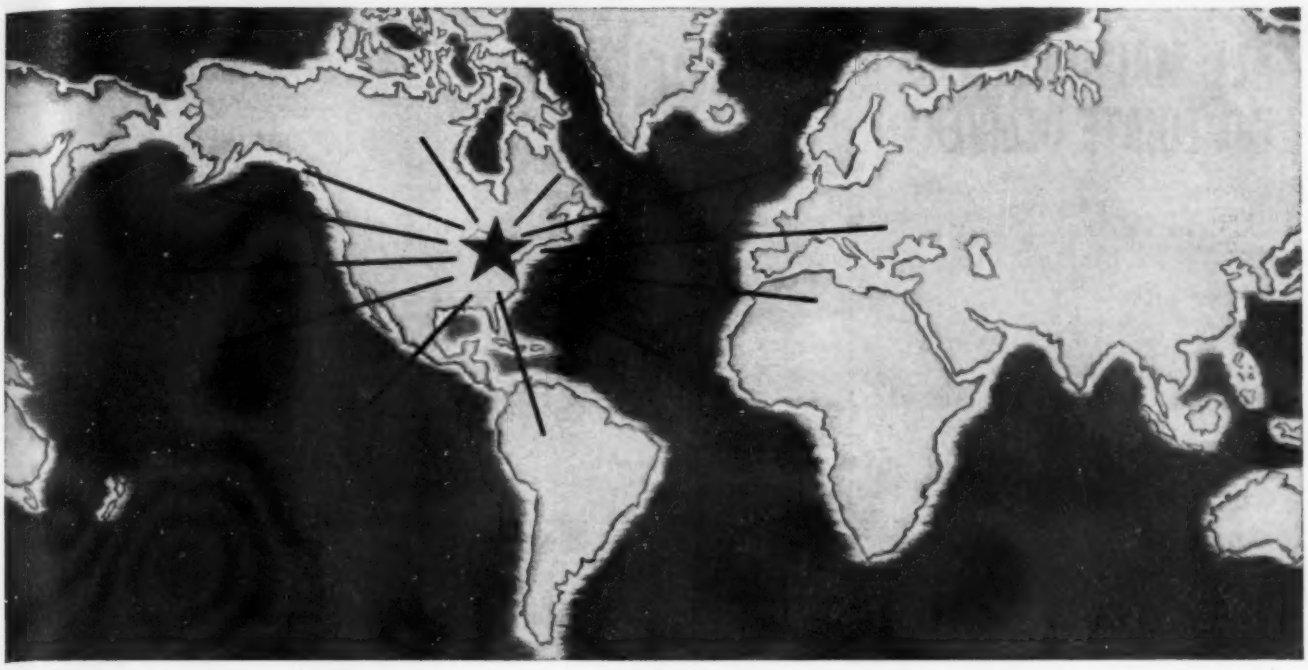

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#36 ST Gould & Eberhardt Gear Cutter, s.p. drive, capacity 3 stacks of 6" spur gears.

GRINDERS—#1 Gardner Face Grinder, AC motor drive, table 10"x30", hydraulic feed to table 30".
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6"x18" Landis Plain, self-contained motor drive.
Wells Tool and Cutter Grinder, belt drive with equipment.

LATHES—40"x15' Davis double back geared motorized, plain change Gear.
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24"x10' Flather engine lathe, belt drive, plain change.
20"x10' Bridgeport engine lathe, belt drive, plain change.
19"x8' Sidney engine lathe, belt drive DBG, quick change.
15"x6' Carroll Jamieson belt drive, plain change Gear.

MILLERS—

#3 Brown & Sharpe Plain Miller, belt drive but motorized, working surface of the table 12" x 42" quick change feed.

Steptoe Plain Miller, belt drive, back geared, table 8¾" x 30".

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#1A Crescent Degreaser & Washer, motor drive.
2¼" Model F Gridley 4-spindle Automatic, with equipment.
24" throat Bement single end Punch, belt drive, cap. ⅝"x⅝".
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LATHES

Putnam, 38"x16' M.D. Motor and controls
Leblond, 14"x6' M.D.
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#3 Hendey, Table 13"x49"
Garvin-Duplex, Table 12x64"
#12 Brown & Sharpe Production
18" Cincinnati
#7 Beckers
Becker Vertical, Model AB

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Leland & Gifford, 4 Sp. Power feed to Spindle.

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Fox Monitor, 1¼" thru spindle.
Jones & Lamson, 2x24" M.D.
Pratt & Whitney, 1½" cap.

MISCELLANEOUS

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Schatz Angle Shear, 1" cap.
G & E Gear Cutter, Bevel
#17 Williams & White Heavy Duty Punch, 36" Throat
Geo. A. Ohl Power Shear, 10'. 14 Gauge
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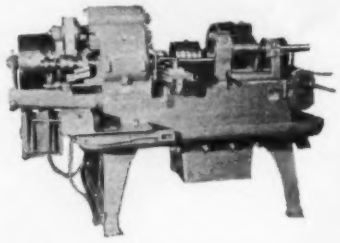

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Grinder #60 Heald, cylinder
Grinder, Sellers Tool
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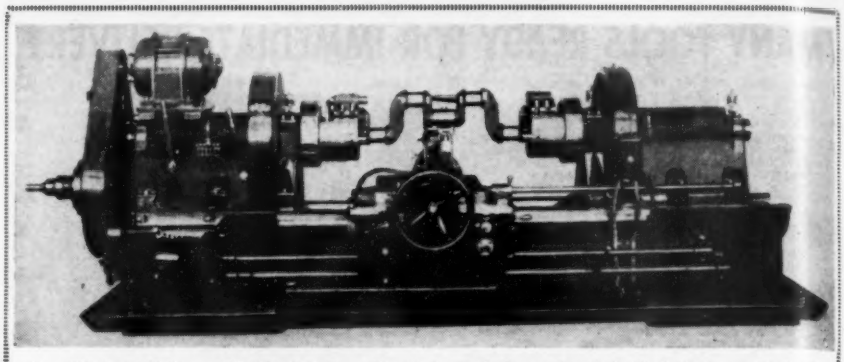

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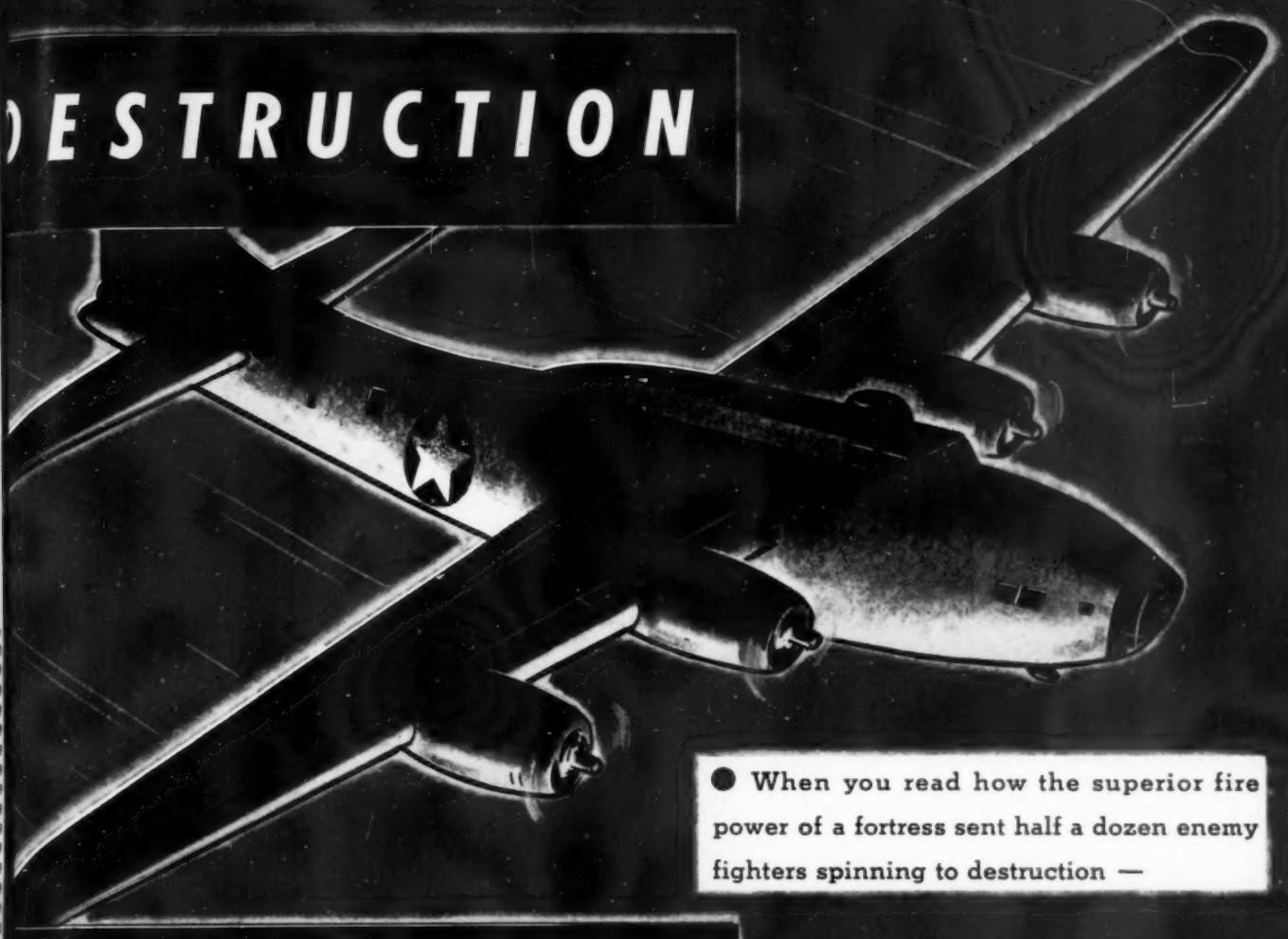

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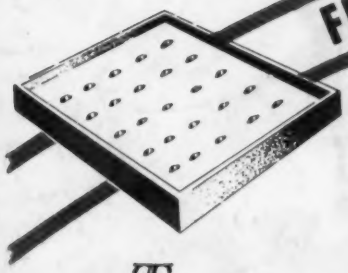

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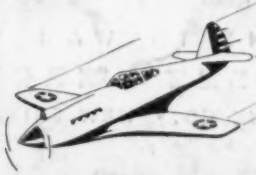

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